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LIST OF NOTATION

Symbols

A	Cross-sectional area of flow passage
A_w	Wetted area of flow passage
a	Speed of sound
a_0	Speed of sound at standard conditions (0°C and 1 atm)
a^*	Nondimensional speed of sound, $a^* = a/a_0$
c_p	Specific heat at constant pressure, $c_p = (\partial H/\partial T)_p$
c_p^*	Nondimensional specific heat at constant pressure, $c_p^* = c_p/R$
c_v	Specific heat at constant volume, $c_v = (\partial U/\partial T)_v$
D	Diameter of circular flow passage
D_h	Hydraulic diameter of noncircular flow passage, $D_h = 4A/u$
F	Impulse function, $F = A(p + \rho V^2/g_c)$
f	Friction factor, $f = 2g_c\tau_w/\rho V^2$
G	Mass velocity, $G = \rho V$
g_c	Conversion factor in Newton's law of motion (See Table O) for value in four common unit systems.)
H	Enthalpy
H_0	Reference enthalpy; defined as being equal to the value of the internal thermal energy at 0°K and very low pressure
H^*	Nondimensional enthalpy, $H^* = (H - H_0)/RT_0$
k	Ratio of specific heats, $k = c_p/c_v$

PART 1

One-dimensional compressible flow functions of a perfect gas

1.1 THE ISENTROPIC FLOW PROCESS

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TABLE 1.1
ONE-DIMENSIONAL COMPRESSIBLE FLOW FUNCTIONS OF A PERFECT GAS
FOR AN ISENTROPIC FLOW PROCESS

PERFECT GAS 8
 ISENTROPIC
 $k = 1.20$

M	p/p^0	T/T^0	ρ/ρ^0	$\frac{pV^2}{2g_c p^0}$	A^*/A	F^*/F	V/a^*	$\frac{pV}{p^0} \sqrt{\frac{RT^0}{g_c}}$	$\frac{pV}{p^0} \sqrt{\frac{RT^0}{g_c}}$	M
0.00	1.0000	1.0000	1.0000	0.000000	0.00000	0.00000	0.0000	0.00000	0.00000	0.00
0.01	0.9999	1.0000	0.9999	0.000060	0.01689	0.02097	0.0105	0.01095	0.01095	0.01
0.02	0.9998	1.0000	0.9998	0.000240	0.03377	0.04193	0.0210	0.02191	0.02190	0.02
0.03	0.9995	0.9999	0.9996	0.000540	0.05065	0.06286	0.0315	0.03286	0.03285	0.03
0.04	0.9990	0.9998	0.9992	0.000959	0.06751	0.08375	0.0419	0.04382	0.04378	0.04
0.05	0.9985	0.9998	0.9988	0.001498	0.08434	0.1046	0.0524	0.05478	0.05470	0.05
0.06	0.9978	0.9996	0.9982	0.002155	0.1011	0.1253	0.0629	0.06574	0.06560	0.06
0.07	0.9971	0.9995	0.9976	0.002931	0.1179	0.1460	0.0734	0.07670	0.07647	0.07
0.08	0.9962	0.9994	0.9968	0.003825	0.1347	0.1666	0.0839	0.08766	0.08733	0.08
0.09	0.9952	0.9992	0.9960	0.004836	0.1513	0.1870	0.0944	0.09863	0.09815	0.09
0.10	0.9940	0.9990	0.9950	0.005964	0.1680	0.2074	0.1048	0.1096	0.1089	0.10
0.11	0.9928	0.9988	0.9940	0.007208	0.1846	0.2276	0.1153	0.1206	0.1197	0.11
0.12	0.9914	0.9986	0.9928	0.008566	0.2011	0.2476	0.1258	0.1315	0.1304	0.12
0.13	0.9899	0.9983	0.9916	0.01004	0.2176	0.2675	0.1362	0.1425	0.1411	0.13
0.14	0.9883	0.9980	0.9903	0.01162	0.2339	0.2872	0.1467	0.1535	0.1517	0.14
0.15	0.9866	0.9978	0.9888	0.01332	0.2503	0.3067	0.1571	0.1645	0.1623	0.15
0.16	0.9848	0.9974	0.9873	0.01513	0.2665	0.3260	0.1676	0.1755	0.1728	0.16
0.17	0.9828	0.9971	0.9857	0.01704	0.2826	0.3451	0.1780	0.1865	0.1833	0.17
0.18	0.9808	0.9968	0.9840	0.01907	0.2987	0.3640	0.1885	0.1975	0.1937	0.18
0.19	0.9786	0.9964	0.9821	0.02120	0.3146	0.3827	0.1989	0.2085	0.2041	0.19
0.20	0.9763	0.9960	0.9802	0.02343	0.3305	0.4011	0.2093	0.2195	0.2143	0.20
0.21	0.9739	0.9956	0.9782	0.02577	0.3462	0.4193	0.2198	0.2306	0.2245	0.21
0.22	0.9714	0.9952	0.9761	0.02821	0.3619	0.4372	0.2302	0.2416	0.2347	0.22
0.23	0.9688	0.9947	0.9740	0.03075	0.3774	0.4549	0.2406	0.2526	0.2447	0.23
0.24	0.9661	0.9943	0.9717	0.03339	0.3928	0.4722	0.2510	0.2637	0.2547	0.24
0.25	0.9633	0.9938	0.9693	0.03612	0.4081	0.4893	0.2614	0.2747	0.2646	0.25
0.26	0.9604	0.9933	0.9669	0.03895	0.4232	0.5062	0.2718	0.2858	0.2745	0.26
0.27	0.9574	0.9928	0.9643	0.04187	0.4382	0.5227	0.2822	0.2968	0.2842	0.27
0.28	0.9542	0.9922	0.9617	0.04489	0.4531	0.5389	0.2925	0.3079	0.2938	0.28
0.29	0.9510	0.9917	0.9590	0.04799	0.4678	0.5549	0.3029	0.3190	0.3034	0.29
0.30	0.9477	0.9911	0.9562	0.05117	0.4824	0.5705	0.3132	0.3301	0.3128	0.30
0.31	0.9442	0.9905	0.9533	0.05444	0.4968	0.5858	0.3236	0.3412	0.3222	0.31
0.32	0.9407	0.9899	0.9503	0.05780	0.5111	0.6008	0.3339	0.3523	0.3314	0.32
0.33	0.9371	0.9892	0.9473	0.06123	0.5252	0.6155	0.3442	0.3635	0.3406	0.33
0.34	0.9334	0.9886	0.9442	0.06474	0.5391	0.6299	0.3546	0.3746	0.3496	0.34
0.35	0.9296	0.9879	0.9409	0.06832	0.5529	0.6440	0.3649	0.3857	0.3586	0.35
0.36	0.9256	0.9872	0.9376	0.07198	0.5665	0.6577	0.3751	0.3969	0.3674	0.36
0.37	0.9217	0.9865	0.9343	0.07570	0.5799	0.6712	0.3854	0.4081	0.3761	0.37
0.38	0.9176	0.9858	0.9308	0.07950	0.5932	0.6843	0.3957	0.4193	0.3847	0.38
0.39	0.9134	0.9850	0.9273	0.08336	0.6063	0.6970	0.4060	0.4305	0.3932	0.39
0.40	0.9092	0.9843	0.9237	0.08728	0.6192	0.7095	0.4162	0.4417	0.4015	0.40
0.41	0.9048	0.9835	0.9200	0.09126	0.6319	0.7217	0.4264	0.4529	0.4098	0.41
0.42	0.9004	0.9827	0.9163	0.09530	0.6444	0.7335	0.4367	0.4641	0.4179	0.42
0.43	0.8959	0.9818	0.9125	0.09939	0.6567	0.7450	0.4469	0.4754	0.4259	0.43
0.44	0.8913	0.9810	0.9086	0.1035	0.6688	0.7562	0.4571	0.4866	0.4338	0.44
0.45	0.8867	0.9802	0.9046	0.1077	0.6807	0.7670	0.4673	0.4979	0.4415	0.45
0.46	0.8819	0.9793	0.9006	0.1120	0.6925	0.7776	0.4774	0.5092	0.4491	0.46
0.47	0.8771	0.9784	0.8965	0.1163	0.7040	0.7879	0.4876	0.5205	0.4566	0.47
0.48	0.8723	0.9775	0.8924	0.1206	0.7153	0.7978	0.4977	0.5318	0.4639	0.48
0.49	0.8673	0.9766	0.8881	0.1249	0.7264	0.8075	0.5079	0.5432	0.4711	0.49
0.50	0.8623	0.9756	0.8839	0.1293	0.7373	0.8168	0.5180	0.5545	0.4782	0.50
0.51	0.8572	0.9746	0.8795	0.1338	0.7480	0.8258	0.5281	0.5659	0.4851	0.51
0.52	0.8521	0.9737	0.8751	0.1382	0.7585	0.8346	0.5382	0.5773	0.4919	0.52
0.53	0.8469	0.9727	0.8707	0.1427	0.7687	0.8431	0.5482	0.5887	0.4985	0.53
0.54	0.8416	0.9717	0.8661	0.1472	0.7787	0.8512	0.5583	0.6001	0.5050	0.54
0.55	0.8363	0.9706	0.8616	0.1518	0.7886	0.8591	0.5683	0.6115	0.5114	0.55
0.56	0.8309	0.9696	0.8569	0.1563	0.7982	0.8668	0.5783	0.6230	0.5176	0.56
0.57	0.8254	0.9685	0.8523	0.1609	0.8075	0.8741	0.5883	0.6345	0.5237	0.57
0.58	0.8199	0.9675	0.8475	0.1655	0.8167	0.8812	0.5983	0.6460	0.5296	0.58
0.59	0.8144	0.9664	0.8427	0.1701	0.8256	0.8880	0.6083	0.6575	0.5354	0.59
0.60	0.8088	0.9653	0.8379	0.1747	0.8343	0.8946	0.6183	0.6690	0.5411	0.60
0.61	0.8032	0.9641	0.8330	0.1793	0.8428	0.9009	0.6282	0.6805	0.5466	0.61
0.62	0.7975	0.9630	0.8281	0.1839	0.8510	0.9069	0.6381	0.6921	0.5519	0.62
0.63	0.7917	0.9618	0.8232	0.1885	0.8591	0.9127	0.6480	0.7037	0.5571	0.63
0.64	0.7860	0.9607	0.8181	0.1932	0.8669	0.9183	0.6579	0.7153	0.5622	0.64
0.65	0.7801	0.9595	0.8131	0.1978	0.8744	0.9237	0.6678	0.7269	0.5671	0.65
0.66	0.7743	0.9583	0.8080	0.2024	0.8818	0.9288	0.6776	0.7386	0.5719	0.66
0.67	0.7684	0.9570	0.8029	0.2070	0.8889	0.9337	0.6874	0.7502	0.5765	0.67
0.68	0.7625	0.9558	0.7977	0.2115	0.8958	0.9383	0.6973	0.7619	0.5809	0.68
0.69	0.7565	0.9546	0.7925	0.2161	0.9024	0.9428	0.7070	0.7736	0.5853	0.69
0.70	0.7505	0.9533	0.7873	0.2206	0.9089	0.9470	0.7168	0.7854	0.5894	0.70
0.71	0.7445	0.9520	0.7820	0.2252	0.9150	0.9511	0.7266	0.7971	0.5934	0.71
0.72	0.7384	0.9507	0.7767	0.2297	0.9210	0.9549	0.7363	0.8089	0.5973	0.72
0.73	0.7323	0.9494	0.7714	0.2342	0.9268	0.9586	0.7460	0.8207	0.6010	0.73
0.74	0.7262	0.9481	0.7660	0.2386	0.9323	0.9620	0.7557	0.8325	0.6046	0.74
0.75	0.7201	0.9467	0.7606	0.2430	0.9376	0.9653	0.7654	0.8444	0.6080	0.75
0.76	0.7140	0.9454	0.7552	0.2474	0.9426	0.9684	0.7750	0.8562	0.6113	0.76
0.77	0.7078	0.9440	0.7498	0.2518	0.9475	0.9713	0.7847	0.8681	0.6145	0.77
0.78	0.7016	0.9426	0.7443	0.2561	0.9521	0.9740	0.7943	0.8801	0.6175	0.78
0.79	0.6954	0.9413	0.7388	0.2604	0.9565	0.9766	0.8039	0.8920	0.6203	0.79
0.80	0.6892	0.9398	0.7333	0.2647	0.9607	0.9790	0.8134	0.9040	0.6230	0.80

TABLE 1.1.1
ONE-DIMENSIONAL COMPRESSIBLE FLOW FUNCTIONS OF A PERFECT GAS
FOR AN ISENTROPIC FLOW PROCESS

M	p/p^0	T/T^0	ρ/ρ^0	$\frac{\rho V^2}{2g_c p^0}$	A^*/A	F^*/F	V/a^*	$\frac{\rho V}{p} \sqrt{\frac{RT^0}{g_c}}$	$\frac{\rho V}{p^0} \sqrt{\frac{RT^0}{g_c}}$	M
0.80	0.6892	0.9398	0.7333	0.2647	0.9607	0.9790	0.8134	0.9040	0.6230	0.80
0.81	0.6830	0.9384	0.7278	0.2689	0.9646	0.9813	0.8230	0.9160	0.6256	0.81
0.82	0.6767	0.9370	0.7223	0.2730	0.9683	0.9834	0.8325	0.9280	0.6280	0.82
0.83	0.6705	0.9355	0.7167	0.2771	0.9719	0.9854	0.8420	0.9400	0.6303	0.83
0.84	0.6643	0.9341	0.7111	0.2812	0.9752	0.9872	0.8515	0.9521	0.6324	0.84
0.85	0.6580	0.9326	0.7055	0.2852	0.9783	0.9889	0.8609	0.9642	0.6344	0.85
0.86	0.6517	0.9311	0.6999	0.2892	0.9811	0.9904	0.8704	0.9763	0.6363	0.86
0.87	0.6455	0.9296	0.6943	0.2931	0.9838	0.9919	0.8798	0.9884	0.6380	0.87
0.88	0.6392	0.9281	0.6887	0.2970	0.9862	0.9931	0.8892	1.001	0.6396	0.88
0.89	0.6329	0.9266	0.6831	0.3008	0.9885	0.9943	0.8985	1.013	0.6411	0.89
0.90	0.6267	0.9251	0.6774	0.3046	0.9905	0.9953	0.9079	1.025	0.6424	0.90
0.91	0.6204	0.9235	0.6718	0.3083	0.9923	0.9963	0.9172	1.037	0.6436	0.91
0.92	0.6142	0.9220	0.6661	0.3119	0.9940	0.9971	0.9265	1.050	0.6446	0.92
0.93	0.6079	0.9204	0.6605	0.3155	0.9954	0.9978	0.9358	1.062	0.6456	0.93
0.94	0.6017	0.9188	0.6548	0.3190	0.9966	0.9984	0.9450	1.074	0.6464	0.94
0.95	0.5954	0.9172	0.6492	0.3224	0.9977	0.9989	0.9542	1.087	0.6470	0.95
0.96	0.5892	0.9156	0.6435	0.3258	0.9985	0.9993	0.9634	1.099	0.6476	0.96
0.97	0.5830	0.9140	0.6379	0.3291	0.9992	0.9996	0.9726	1.111	0.6480	0.97
0.98	0.5768	0.9124	0.6322	0.3324	0.9996	0.9998	0.9818	1.124	0.6483	0.98
0.99	0.5706	0.9107	0.6266	0.3356	0.9999	1.0000	0.9909	1.136	0.6485	0.99
1.00	0.5645	0.9091	0.6209	0.3387	1.0000	1.0000	1.000	1.149	0.6485	1.00
1.01	0.5583	0.9074	0.6153	0.3417	0.9999	1.0000	1.009	1.161	0.6485	1.01
1.02	0.5522	0.9058	0.6096	0.3447	0.9996	0.9998	1.018	1.174	0.6483	1.02
1.03	0.5461	0.9041	0.6040	0.3476	0.9992	0.9996	1.027	1.187	0.6480	1.03
1.04	0.5400	0.9024	0.5984	0.3504	0.9986	0.9994	1.036	1.199	0.6476	1.04
1.05	0.5339	0.9007	0.5928	0.3532	0.9978	0.9990	1.045	1.212	0.6471	1.05
1.06	0.5279	0.8990	0.5872	0.3559	0.9968	0.9986	1.054	1.225	0.6465	1.06
1.07	0.5218	0.8973	0.5816	0.3585	0.9957	0.9981	1.063	1.237	0.6457	1.07
1.08	0.5158	0.8955	0.5760	0.3610	0.9944	0.9976	1.072	1.250	0.6449	1.08
1.09	0.5099	0.8938	0.5705	0.3635	0.9929	0.9970	1.081	1.263	0.6440	1.09
1.10	0.5039	0.8921	0.5649	0.3658	0.9913	0.9963	1.090	1.276	0.6429	1.10
1.11	0.4980	0.8903	0.5594	0.3682	0.9896	0.9956	1.098	1.289	0.6418	1.11
1.12	0.4921	0.8885	0.5538	0.3704	0.9877	0.9948	1.107	1.302	0.6405	1.12
1.13	0.4863	0.8868	0.5483	0.3725	0.9856	0.9940	1.116	1.315	0.6392	1.13
1.14	0.4804	0.8850	0.5429	0.3746	0.9834	0.9931	1.125	1.327	0.6377	1.14
1.15	0.4746	0.8832	0.5374	0.3766	0.9810	0.9922	1.134	1.340	0.6362	1.15
1.16	0.4689	0.8814	0.5319	0.3785	0.9785	0.9912	1.142	1.354	0.6346	1.16
1.17	0.4631	0.8796	0.5265	0.3804	0.9759	0.9902	1.151	1.367	0.6329	1.17
1.18	0.4574	0.8778	0.5211	0.3821	0.9731	0.9891	1.159	1.380	0.6311	1.18
1.19	0.4517	0.8760	0.5157	0.3838	0.9702	0.9880	1.168	1.393	0.6292	1.19
1.20	0.4461	0.8741	0.5104	0.3854	0.9672	0.9869	1.177	1.406	0.6272	1.20
1.21	0.4405	0.8723	0.5050	0.3870	0.9640	0.9857	1.185	1.419	0.6252	1.21
1.22	0.4350	0.8704	0.4997	0.3884	0.9607	0.9845	1.194	1.432	0.6231	1.22
1.23	0.4294	0.8686	0.4944	0.3898	0.9573	0.9833	1.202	1.446	0.6208	1.23
1.24	0.4239	0.8667	0.4891	0.3911	0.9538	0.9820	1.211	1.459	0.6186	1.24
1.25	0.4185	0.8649	0.4839	0.3923	0.9501	0.9807	1.219	1.472	0.6162	1.25
1.26	0.4131	0.8630	0.4787	0.3935	0.9464	0.9793	1.228	1.486	0.6138	1.26
1.27	0.4077	0.8611	0.4735	0.3946	0.9425	0.9780	1.236	1.499	0.6113	1.27
1.28	0.4024	0.8592	0.4683	0.3956	0.9385	0.9766	1.244	1.513	0.6087	1.28
1.29	0.3971	0.8573	0.4632	0.3965	0.9345	0.9751	1.253	1.526	0.6060	1.29
1.30	0.3918	0.8554	0.4581	0.3973	0.9303	0.9737	1.261	1.540	0.6033	1.30
1.31	0.3866	0.8535	0.4530	0.3981	0.9260	0.9722	1.269	1.553	0.6006	1.31
1.32	0.3815	0.8516	0.4479	0.3988	0.9217	0.9707	1.278	1.567	0.5977	1.32
1.33	0.3763	0.8497	0.4429	0.3994	0.9172	0.9692	1.286	1.581	0.5948	1.33
1.34	0.3713	0.8478	0.4379	0.4000	0.9127	0.9677	1.294	1.594	0.5919	1.34
1.35	0.3662	0.8458	0.4330	0.4005	0.9080	0.9661	1.302	1.608	0.5889	1.35
1.36	0.3612	0.8439	0.4280	0.4009	0.9033	0.9646	1.310	1.622	0.5858	1.36
1.37	0.3563	0.8420	0.4231	0.4012	0.8985	0.9630	1.318	1.636	0.5827	1.37
1.38	0.3514	0.8400	0.4183	0.4015	0.8936	0.9614	1.327	1.649	0.5795	1.38
1.39	0.3465	0.8381	0.4134	0.4017	0.8887	0.9597	1.335	1.663	0.5763	1.39
1.40	0.3417	0.8361	0.4086	0.4018	0.8836	0.9581	1.343	1.677	0.5731	1.40
1.41	0.3369	0.8342	0.4039	0.4019	0.8785	0.9565	1.351	1.691	0.5697	1.41
1.42	0.3322	0.8322	0.3991	0.4019	0.8734	0.9548	1.359	1.705	0.5664	1.42
1.43	0.3275	0.8302	0.3944	0.4018	0.8681	0.9531	1.367	1.719	0.5630	1.43
1.44	0.3228	0.8283	0.3898	0.4017	0.8628	0.9515	1.374	1.733	0.5596	1.44
1.45	0.3182	0.8263	0.3851	0.4015	0.8575	0.9498	1.382	1.747	0.5561	1.45
1.46	0.3137	0.8243	0.3805	0.4012	0.8520	0.9481	1.390	1.762	0.5526	1.46
1.47	0.3092	0.8223	0.3760	0.4009	0.8466	0.9464	1.398	1.776	0.5490	1.47
1.48	0.3047	0.8203	0.3715	0.4005	0.8411	0.9447	1.406	1.790	0.5454	1.48
1.49	0.3003	0.8183	0.3670	0.4000	0.8355	0.9429	1.414	1.804	0.5418	1.49
1.50	0.2959	0.8163	0.3625	0.3995	0.8299	0.9412	1.421	1.819	0.5382	1.50
1.51	0.2916	0.8143	0.3581	0.3989	0.8242	0.9395	1.429	1.833	0.5345	1.51
1.52	0.2873	0.8123	0.3537	0.3983	0.8185	0.9377	1.437	1.847	0.5308	1.52
1.53	0.2831	0.8103	0.3494	0.3976	0.8127	0.9360	1.444	1.862	0.5271	1.53
1.54	0.2789	0.8083	0.3450	0.3969	0.8069	0.9342	1.452	1.876	0.5233	1.54
1.55	0.2748	0.8063	0.3408	0.3961	0.8011	0.9325	1.460	1.891	0.5195	1.55
1.56	0.2707	0.8043	0.3365	0.3952	0.7952	0.9307	1.467	1.906	0.5157	1.56
1.57	0.2666	0.8023	0.3323	0.3943	0.7894	0.9290	1.475	1.920	0.5119	1.57
1.58	0.2626	0.8002	0.3282	0.3933	0.7834	0.9272	1.482	1.935	0.5081	1.58
1.59	0.2586	0.7982	0.3240	0.3923	0.7775	0.9255	1.490	1.950	0.5042	1.59
1.60	0.2547	0.7962	0.3199	0.3912	0.7715	0.9237	1.497	1.964	0.5003	1.60

TABLE 1.1.1
ONE-DIMENSIONAL COMPRESSIBLE FLOW FUNCTIONS OF A PERFECT GAS
FOR AN ISENTROPIC FLOW PROCESS

M	p/p^0	T/T^0	ρ/ρ^0	$\frac{\rho V^2}{2g_c p^0}$	A^*/A	F^*/F	V/a^*	$\frac{\rho V}{p} \sqrt{\frac{RT^0}{g_c}}$	$\frac{\rho V}{p^0} \sqrt{\frac{RT^0}{g_c}}$	M
1.60	0.2547	0.7962	0.3199	0.3912	0.7715	0.9237	1.497	1.964	0.5003	1.60
1.62	0.2470	0.7921	0.3119	0.3890	0.7595	0.9202	1.512	1.994	0.4925	1.62
1.64	0.2395	0.7880	0.3039	0.3865	0.7474	0.9167	1.527	2.024	0.4847	1.64
1.66	0.2322	0.7840	0.2961	0.3839	0.7352	0.9131	1.542	2.054	0.4768	1.66
1.68	0.2250	0.7799	0.2885	0.3810	0.7230	0.9096	1.556	2.084	0.4689	1.68
1.70	0.2180	0.7758	0.2810	0.3780	0.7108	0.9061	1.570	2.114	0.4609	1.70
1.72	0.2112	0.7717	0.2737	0.3749	0.6985	0.9026	1.585	2.145	0.4530	1.72
1.74	0.2046	0.7676	0.2665	0.3716	0.6862	0.8992	1.599	2.176	0.4450	1.74
1.76	0.1981	0.7635	0.2594	0.3682	0.6739	0.8957	1.613	2.206	0.4371	1.76
1.78	0.1918	0.7594	0.2525	0.3646	0.6617	0.8922	1.627	2.238	0.4291	1.78
1.80	0.1856	0.7553	0.2458	0.3609	0.6495	0.8888	1.641	2.269	0.4212	1.80
1.82	0.1797	0.7512	0.2392	0.3571	0.6373	0.8854	1.654	2.300	0.4133	1.82
1.84	0.1738	0.7471	0.2327	0.3532	0.6251	0.8820	1.668	2.332	0.4054	1.84
1.86	0.1682	0.7430	0.2264	0.3491	0.6130	0.8787	1.681	2.364	0.3976	1.86
1.88	0.1627	0.7389	0.2202	0.3450	0.6010	0.8753	1.695	2.396	0.3898	1.88
1.90	0.1573	0.7348	0.2141	0.3408	0.5891	0.8720	1.708	2.428	0.3821	1.90
1.92	0.1521	0.7307	0.2082	0.3365	0.5773	0.8687	1.721	2.461	0.3744	1.92
1.94	0.1471	0.7266	0.2025	0.3322	0.5655	0.8655	1.734	2.493	0.3667	1.94
1.96	0.1422	0.7225	0.1968	0.3278	0.5538	0.8622	1.747	2.526	0.3592	1.96
1.98	0.1374	0.7184	0.1913	0.3233	0.5423	0.8590	1.760	2.559	0.3517	1.98
2.00	0.1328	0.7143	0.1859	0.3187	0.5309	0.8558	1.773	2.592	0.3443	2.00
2.05	0.1218	0.7041	0.1731	0.3072	0.5028	0.8480	1.804	2.676	0.3261	2.05
2.10	0.1117	0.6940	0.1609	0.2955	0.4756	0.8404	1.835	2.761	0.3084	2.10
2.15	0.1023	0.6839	0.1496	0.2837	0.4492	0.8330	1.865	2.848	0.2913	2.15
2.20	0.09363	0.6739	0.1389	0.2719	0.4238	0.8257	1.894	2.936	0.2749	2.20
2.25	0.08563	0.6639	0.1290	0.2601	0.3994	0.8187	1.923	3.025	0.2590	2.25
2.30	0.07826	0.6540	0.1197	0.2484	0.3760	0.8119	1.951	3.115	0.2438	2.30
2.35	0.07149	0.6442	0.1110	0.2369	0.3535	0.8052	1.978	3.207	0.2293	2.35
2.40	0.06526	0.6345	0.1029	0.2255	0.3321	0.7988	2.005	3.301	0.2154	2.40
2.45	0.05955	0.6249	0.09529	0.2145	0.3117	0.7925	2.031	3.395	0.2022	2.45
2.50	0.05431	0.6154	0.08825	0.2037	0.2924	0.7865	2.057	3.491	0.1896	2.50
2.55	0.04951	0.6060	0.08171	0.1932	0.2740	0.7806	2.082	3.588	0.1777	2.55
2.60	0.04512	0.5967	0.07562	0.1830	0.2565	0.7749	2.106	3.687	0.1664	2.60
2.65	0.04110	0.5875	0.06997	0.1732	0.2400	0.7693	2.130	3.787	0.1557	2.65
2.70	0.03743	0.5784	0.06472	0.1637	0.2245	0.7640	2.154	3.889	0.1456	2.70
2.75	0.03408	0.5694	0.05985	0.1546	0.2098	0.7588	2.176	3.992	0.1360	2.75
2.80	0.03102	0.5605	0.05534	0.1459	0.1960	0.7537	2.199	4.097	0.1271	2.80
2.85	0.02823	0.5518	0.05116	0.1376	0.1829	0.7488	2.220	4.203	0.1186	2.85
2.90	0.02568	0.5432	0.04729	0.1296	0.1707	0.7441	2.242	4.310	0.1107	2.90
2.95	0.02337	0.5347	0.04370	0.1220	0.1592	0.7395	2.262	4.419	0.1033	2.95
3.00	0.02126	0.5263	0.04039	0.1148	0.1485	0.7351	2.283	4.530	0.09629	3.00
3.05	0.01933	0.5181	0.03732	0.1079	0.1384	0.7308	2.302	4.642	0.08975	3.05
3.10	0.01758	0.5099	0.03448	0.1014	0.1289	0.7266	2.322	4.755	0.08362	3.10
3.15	0.01599	0.5019	0.03186	0.09522	0.1201	0.7226	2.341	4.870	0.07790	3.15
3.20	0.01455	0.4941	0.02944	0.08937	0.1119	0.7187	2.359	4.987	0.07254	3.20
3.25	0.01323	0.4863	0.02720	0.08384	0.1041	0.7149	2.377	5.105	0.06754	3.25
3.30	0.01203	0.4787	0.02514	0.07862	0.09694	0.7112	2.395	5.225	0.06287	3.30
3.35	0.01095	0.4712	0.02323	0.07370	0.09022	0.7076	2.412	5.346	0.05851	3.35
3.40	0.009957	0.4638	0.02147	0.06906	0.08396	0.7041	2.429	5.469	0.05445	3.40
3.45	0.009058	0.4566	0.01984	0.06469	0.07812	0.7008	2.445	5.593	0.05066	3.45
3.50	0.008242	0.4494	0.01834	0.06058	0.07268	0.6975	2.461	5.719	0.04714	3.50
3.55	0.007500	0.4424	0.01695	0.05671	0.06761	0.6944	2.477	5.847	0.04385	3.55
3.60	0.006826	0.4355	0.01567	0.05308	0.06290	0.6913	2.492	5.976	0.04079	3.60
3.65	0.006214	0.4288	0.01449	0.04967	0.05850	0.6883	2.507	6.106	0.03794	3.65
3.70	0.005657	0.4221	0.01340	0.04647	0.05442	0.6854	2.521	6.238	0.03529	3.70
3.75	0.005152	0.4156	0.01240	0.04347	0.05062	0.6826	2.535	6.372	0.03283	3.75
3.80	0.004692	0.4092	0.01147	0.04065	0.04709	0.6799	2.549	6.508	0.03054	3.80
3.85	0.004275	0.4029	0.01061	0.03802	0.04380	0.6773	2.563	6.645	0.02841	3.85
3.90	0.003895	0.3967	0.009821	0.03555	0.04074	0.6747	2.576	6.783	0.02642	3.90
3.95	0.003551	0.3906	0.009091	0.03324	0.03791	0.6722	2.589	6.924	0.02458	3.95
4.00	0.003237	0.3846	0.008417	0.03108	0.03527	0.6698	2.602	7.065	0.02287	4.00
4.05	0.002952	0.3788	0.007794	0.02905	0.03281	0.6674	2.614	7.209	0.02128	4.05
4.10	0.002693	0.3730	0.007220	0.02716	0.03054	0.6651	2.626	7.354	0.01980	4.10
4.15	0.002457	0.3673	0.006689	0.02539	0.02842	0.6629	2.638	7.501	0.01843	4.15
4.20	0.002243	0.3618	0.006199	0.02374	0.02645	0.6607	2.650	7.649	0.01715	4.20
4.25	0.002048	0.3563	0.005746	0.02219	0.02462	0.6586	2.661	7.799	0.01597	4.25
4.30	0.001870	0.3510	0.005328	0.02075	0.02293	0.6566	2.672	7.951	0.01487	4.30
4.35	0.001708	0.3458	0.004941	0.01940	0.02135	0.6546	2.683	8.104	0.01384	4.35
4.40	0.001561	0.3406	0.004584	0.01814	0.01988	0.6526	2.693	8.259	0.01289	4.40
4.45	0.001427	0.3355	0.004253	0.01696	0.01852	0.6507	2.704	8.415	0.01201	4.45
4.50	0.001305	0.3306	0.003948	0.01586	0.01725	0.6489	2.714	8.574	0.01119	4.50
4.55	0.001194	0.3257	0.003665	0.01483	0.01608	0.6471	2.723	8.734	0.01043	4.55
4.60	0.001092	0.3209	0.003404	0.01387	0.01498	0.6454	2.733	8.895	0.009718	4.60
4.65	0.001000	0.3162	0.003162	0.01297	0.01397	0.6437	2.743	9.058	0.009059	4.65
4.70	0.0009158	0.3116	0.002939	0.01214	0.01302	0.6420	2.752	9.223	0.008446	4.70
4.75	0.0008389	0.3071	0.002732	0.01136	0.01215	0.6404	2.761	9.390	0.007877	4.75
4.80	0.0007687	0.3027	0.002540	0.01063	0.01133	0.6388	2.770	9.558	0.007347	4.80
4.85	0.0007047	0.2983	0.002362	0.009945	0.01057	0.6373	2.778	9.727	0.006855	4.85
4.90	0.0006462	0.2940	0.002198	0.009309	0.009863	0.6358	2.787	9.899	0.006397	4.90
4.95	0.0005928	0.2898	0.002045	0.008715	0.009206	0.6344	2.795	10.07	0.005971	4.95
5.00	0.0005440	0.2857	0.001904	0.008160	0.008595	0.6329	2.803	10.25	0.005574	5.00

TABLE 1.11
ONE-DIMENSIONAL COMPRESSIBLE FLOW FUNCTIONS OF A PERFECT GAS
FOR AN ISENTROPIC FLOW PROCESS

M	p/p^0	T/T^0	ρ/ρ^0	$\frac{\rho V^2}{2g_c p^0}$	A^*/A	F^*/F	V/a^*	$\frac{\rho V}{p} \sqrt{\frac{RT^0}{g_c}}$	$\frac{\rho V}{p^0} \sqrt{\frac{RT^0}{g_c}}$	M
5.00	0.0005440	0.2857	0.001904	0.008160	0.008595	0.6329	2.803	10.25	0.005574	5.00
5.05	0.0004994	0.2817	0.001773	0.007642	0.008027	0.6316	2.811	10.42	0.005205	5.05
5.10	0.0004586	0.2777	0.001652	0.007157	0.007497	0.6302	2.819	10.60	0.004862	5.10
5.15	0.0004213	0.2738	0.001539	0.006705	0.007005	0.6289	2.826	10.78	0.004543	5.15
5.20	0.0003872	0.2700	0.001434	0.006282	0.006546	0.6276	2.834	10.96	0.004245	5.20
5.25	0.0003560	0.2662	0.001337	0.005888	0.006119	0.6264	2.841	11.15	0.003968	5.25
5.30	0.0003274	0.2625	0.001247	0.005519	0.005721	0.6251	2.848	11.33	0.003710	5.30
5.35	0.0003013	0.2589	0.001164	0.005174	0.005350	0.6239	2.855	11.52	0.003470	5.35
5.40	0.0002773	0.2554	0.001086	0.004852	0.005005	0.6228	2.862	11.71	0.003246	5.40
5.45	0.0002553	0.2519	0.001014	0.004550	0.004683	0.6216	2.869	11.90	0.003037	5.45
5.50	0.000235	0.2484	0.0009466	0.004269	0.004383	0.6205	2.875	12.09	0.002843	5.50
5.55	0.000216	0.2451	0.0008842	0.004005	0.004104	0.6194	2.882	12.28	0.002661	5.55
5.60	0.0001996	0.2418	0.0008262	0.003759	0.003843	0.6184	2.888	12.48	0.002492	5.60
5.65	0.0001842	0.2385	0.0007723	0.003528	0.003600	0.6173	2.894	12.67	0.002334	5.65
5.70	0.0001699	0.2353	0.0007220	0.003313	0.003373	0.6163	2.900	12.87	0.002187	5.70
5.75	0.0001568	0.2322	0.0006753	0.003111	0.003161	0.6153	2.906	13.07	0.002050	5.75
5.80	0.0001448	0.2291	0.0006318	0.002922	0.002963	0.6144	2.912	13.27	0.001922	5.80
5.85	0.0001337	0.2261	0.0005913	0.002745	0.002778	0.6134	2.918	13.48	0.001802	5.85
5.90	0.0001235	0.2232	0.0005535	0.002580	0.002606	0.6125	2.923	13.68	0.001690	5.90
5.95	0.0001142	0.2203	0.0005183	0.002425	0.002445	0.6116	2.929	13.89	0.001586	5.95
6.00	0.0001055	0.2174	0.0004855	0.002280	0.002294	0.6107	2.934	14.10	0.001488	6.00
6.05	0.00009762	0.2146	0.0004549	0.002144	0.002154	0.6098	2.939	14.31	0.001397	6.05
6.10	0.00009032	0.2118	0.0004264	0.002017	0.002022	0.6090	2.944	14.52	0.001311	6.10
6.15	0.00008360	0.2091	0.0003998	0.001897	0.001899	0.6082	2.950	14.73	0.001232	6.15
6.20	0.00007740	0.2064	0.0003750	0.001785	0.001784	0.6074	2.955	14.95	0.001157	6.20
6.25	0.00007170	0.2038	0.0003518	0.001680	0.001677	0.6066	2.959	15.17	0.001087	6.25
6.30	0.00006643	0.2012	0.0003301	0.001582	0.001576	0.6058	2.964	15.38	0.001022	6.30
6.35	0.00006157	0.1987	0.0003099	0.001490	0.001482	0.6050	2.969	15.60	0.000961	6.35
6.40	0.00005709	0.1962	0.0002910	0.001403	0.001393	0.6043	2.973	15.83	0.000904	6.40
6.45	0.00005296	0.1938	0.0002733	0.001322	0.001311	0.6035	2.978	16.05	0.000850	6.45
6.50	0.00004914	0.1914	0.0002568	0.001246	0.001233	0.6028	2.982	16.28	0.000800	6.50
6.55	0.00004561	0.1890	0.0002413	0.001174	0.001161	0.6021	2.987	16.50	0.000753	6.55
6.60	0.00004236	0.1867	0.0002269	0.001107	0.001093	0.6014	2.991	16.73	0.000709	6.60
6.65	0.00003935	0.1844	0.0002133	0.001044	0.001029	0.6008	2.995	16.96	0.000667	6.65
6.70	0.00003656	0.1822	0.0002007	0.000985	0.0009694	0.6001	2.999	17.20	0.000629	6.70
6.75	0.00003398	0.1800	0.0001888	0.000929	0.0009134	0.5995	3.003	17.43	0.000592	6.75
6.80	0.00003160	0.1778	0.0001777	0.000877	0.0008608	0.5988	3.007	17.67	0.000558	6.80
6.85	0.00002939	0.1757	0.0001673	0.000828	0.0008115	0.5982	3.011	17.90	0.000526	6.85
6.90	0.00002735	0.1736	0.0001576	0.000781	0.0007652	0.5976	3.015	18.14	0.000496	6.90
6.95	0.00002546	0.1715	0.0001484	0.000738	0.0007217	0.5970	3.019	18.38	0.000468	6.95
7.00	0.00002370	0.1695	0.0001399	0.000697	0.0006809	0.5964	3.023	18.63	0.000442	7.00
7.05	0.00002208	0.1675	0.0001318	0.000659	0.0006425	0.5958	3.026	18.87	0.000417	7.05
7.10	0.00002057	0.1655	0.0001243	0.000622	0.0006065	0.5953	3.030	19.12	0.000393	7.10
7.15	0.00001917	0.1636	0.0001172	0.000588	0.0005726	0.5947	3.033	19.36	0.000371	7.15
7.20	0.00001787	0.1617	0.0001106	0.000556	0.0005408	0.5942	3.037	19.61	0.000351	7.20
7.25	0.00001667	0.1598	0.0001043	0.000526	0.0005108	0.5937	3.040	19.86	0.000331	7.25
7.30	0.00001556	0.1580	0.0000985	0.000497	0.0004827	0.5931	3.043	20.12	0.000313	7.30
7.35	0.00001452	0.1562	0.0000930	0.000471	0.0004562	0.5926	3.047	20.37	0.000296	7.35
7.40	0.00001355	0.1544	0.0000878	0.000445	0.0004312	0.5921	3.050	20.63	0.000280	7.40
7.45	0.00001266	0.1527	0.0000829	0.000422	0.0004077	0.5916	3.053	20.89	0.000264	7.45
7.50	0.00001182	0.1509	0.0000784	0.000399	0.0003856	0.5911	3.056	21.15	0.000250	7.50
7.55	0.00001105	0.1492	0.0000741	0.000378	0.0003648	0.5907	3.059	21.41	0.000237	7.55
7.60	0.00001033	0.1476	0.0000700	0.000358	0.0003452	0.5902	3.062	21.67	0.000224	7.60
7.65	0.00000966	0.1459	0.0000662	0.000339	0.0003268	0.5897	3.065	21.94	0.000212	7.65
7.70	0.00000903	0.1443	0.0000626	0.000321	0.0003094	0.5893	3.068	22.20	0.000201	7.70
7.75	0.00000845	0.1427	0.0000592	0.000305	0.0002929	0.5888	3.071	22.47	0.000190	7.75
7.80	0.00000791	0.1412	0.0000561	0.000289	0.0002775	0.5884	3.074	22.74	0.000180	7.80
7.85	0.00000741	0.1396	0.0000531	0.000274	0.0002629	0.5880	3.076	23.01	0.000170	7.85
7.90	0.00000694	0.1381	0.0000502	0.000260	0.0002491	0.5876	3.079	23.29	0.000162	7.90
7.95	0.00000650	0.1366	0.0000476	0.000246	0.0002361	0.5872	3.082	23.56	0.000153	7.95
8.00	0.00000609	0.1351	0.0000451	0.000234	0.0002239	0.5867	3.084	23.84	0.000145	8.00
8.05	0.00000571	0.1337	0.0000427	0.000222	0.0002123	0.5864	3.087	24.12	0.000138	8.05
8.10	0.00000535	0.1323	0.0000405	0.000211	0.0002014	0.5860	3.090	24.40	0.000131	8.10
8.15	0.00000501	0.1309	0.0000384	0.000200	0.0001910	0.5856	3.092	24.68	0.000124	8.15
8.20	0.00000471	0.1295	0.0000364	0.000190	0.0001813	0.5852	3.094	24.96	0.000118	8.20
8.25	0.00000442	0.1281	0.0000345	0.000180	0.0001721	0.5848	3.097	25.25	0.000112	8.25
8.30	0.00000414	0.1268	0.0000327	0.000171	0.0001633	0.5845	3.099	25.54	0.000106	8.30
8.35	0.00000389	0.1254	0.0000310	0.000163	0.0001551	0.5841	3.102	25.83	0.000101	8.35
8.40	0.00000366	0.1241	0.0000295	0.000155	0.0001473	0.5837	3.104	26.12	0.000096	8.40
8.45	0.00000343	0.1228	0.0000280	0.000147	0.0001400	0.5834	3.106	26.41	0.000091	8.45
8.50	0.00000323	0.1216	0.0000266	0.000140	0.0001330	0.5831	3.108	26.70	0.000086	8.50
8.55	0.00000303	0.1203	0.0000252	0.000133	0.0001264	0.5827	3.111	27.00	0.000082	8.55
8.60	0.00000285	0.1191	0.0000240	0.000127	0.0001202	0.5824	3.113	27.30	0.000078	8.60
8.65	0.00000268	0.1179	0.0000228	0.000121	0.0001142	0.5821	3.115	27.60	0.000074	8.65
8.70	0.00000253	0.1167	0.0000216	0.000115	0.0001087	0.5817	3.117	27.90	0.000070	8.70
8.75	0.00000238	0.1155	0.0000206	0.000109	0.0001034	0.5814	3.119	28.20	0.000067	8.75
8.80	0.00000224	0.1144	0.0000196	0.000104	0.0000983	0.5811	3.121	28.51	0.000064	8.80
8.85	0.00000210	0.1132	0.0000186	0.000099	0.0000936	0.5808	3.123	28.81	0.000061	8.85
8.90	0.00000198	0.1121	0.0000177	0.000094	0.0000891	0.5805	3.125	29.12	0.000058	8.90
8.95	0.00000186	0.1110	0.0000168	0.000090	0.0000848	0.5802	3.127	29.43	0.000055	8.95
9.00	0.00000176	0.1099	0.0000160	0.000086	0.0000807	0.5799	3.129	29.74	0.000052	9.00

TABLE 1.1.2
ONE-DIMENSIONAL COMPRESSIBLE FLOW FUNCTIONS OF A PERFECT GAS
FOR AN ISENTROPIC FLOW PROCESS

PERFECT GAS 7
 ISENTROPIC
 $k = 1.30$

M	p/p^0	T/T^0	ρ/ρ^0	$\frac{\rho V^2}{2g_c p^0}$	A^*/A	F^*/F	V/a^*	$\frac{pV}{p^0} \sqrt{\frac{RT^0}{g_c}}$	$\frac{pV}{p^0} \sqrt{\frac{RT^0}{g_c}}$	M
0.00	1.0000	1.0000	1.0000	0.000000	0.00000	0.00000	0.0000	0.00000	0.00000	0.00
0.01	0.9999	1.0000	1.0000	0.000065	0.01709	0.02144	0.0107	0.01140	0.01140	0.01
0.02	0.9997	0.9999	0.9998	0.000260	0.03417	0.04287	0.0214	0.02280	0.02280	0.02
0.03	0.9994	0.9999	0.9996	0.000585	0.05124	0.06427	0.0322	0.03421	0.03419	0.03
0.04	0.9990	0.9998	0.9992	0.001039	0.06829	0.08562	0.0429	0.04561	0.04557	0.04
0.05	0.9984	0.9996	0.9988	0.001622	0.08531	0.1069	0.0536	0.05702	0.05693	0.05
0.06	0.9977	0.9995	0.9982	0.002335	0.1023	0.1281	0.0643	0.06843	0.06827	0.06
0.07	0.9968	0.9993	0.9976	0.003175	0.1193	0.1492	0.0750	0.07984	0.07959	0.07
0.08	0.9959	0.9990	0.9968	0.004143	0.1362	0.1702	0.0857	0.09126	0.09088	0.08
0.09	0.9948	0.9988	0.9960	0.005237	0.1531	0.1911	0.0965	0.1027	0.1021	0.09
0.10	0.9935	0.9985	0.9950	0.006458	0.1699	0.2119	0.1072	0.1141	0.1134	0.10
0.11	0.9922	0.9982	0.9940	0.007803	0.1867	0.2325	0.1179	0.1255	0.1246	0.11
0.12	0.9907	0.9978	0.9928	0.009273	0.2034	0.2529	0.1285	0.1370	0.1357	0.12
0.13	0.9891	0.9975	0.9916	0.01087	0.2200	0.2732	0.1392	0.1484	0.1468	0.13
0.14	0.9874	0.9971	0.9903	0.01258	0.2365	0.2932	0.1499	0.1599	0.1578	0.14
0.15	0.9855	0.9966	0.9888	0.01441	0.2530	0.3131	0.1606	0.1713	0.1688	0.15
0.16	0.9835	0.9962	0.9873	0.01637	0.2694	0.3327	0.1713	0.1828	0.1798	0.16
0.17	0.9814	0.9957	0.9857	0.01844	0.2857	0.3522	0.1819	0.1942	0.1906	0.17
0.18	0.9792	0.9952	0.9840	0.02062	0.3019	0.3714	0.1926	0.2057	0.2015	0.18
0.19	0.9769	0.9946	0.9822	0.02292	0.3180	0.3903	0.2032	0.2172	0.2122	0.19
0.20	0.9744	0.9940	0.9803	0.02533	0.3340	0.4090	0.2138	0.2287	0.2229	0.20
0.21	0.9718	0.9934	0.9783	0.02786	0.3499	0.4274	0.2245	0.2402	0.2335	0.21
0.22	0.9691	0.9928	0.9762	0.03049	0.3656	0.4455	0.2351	0.2517	0.2440	0.22
0.23	0.9663	0.9921	0.9740	0.03323	0.3813	0.4634	0.2457	0.2633	0.2554	0.23
0.24	0.9634	0.9914	0.9717	0.03607	0.3968	0.4809	0.2563	0.2748	0.2668	0.24
0.25	0.9604	0.9907	0.9694	0.03902	0.4122	0.4982	0.2668	0.2864	0.2750	0.25
0.26	0.9572	0.9900	0.9669	0.04206	0.4274	0.5152	0.2774	0.2979	0.2852	0.26
0.27	0.9540	0.9892	0.9644	0.04520	0.4425	0.5318	0.2880	0.3095	0.2953	0.27
0.28	0.9506	0.9884	0.9618	0.04844	0.4575	0.5482	0.2985	0.3211	0.3053	0.28
0.29	0.9471	0.9875	0.9591	0.05177	0.4723	0.5642	0.3090	0.3327	0.3151	0.29
0.30	0.9435	0.9867	0.9563	0.05520	0.4869	0.5799	0.3196	0.3444	0.3249	0.30
0.31	0.9399	0.9858	0.9534	0.05871	0.5014	0.5953	0.3301	0.3560	0.3346	0.31
0.32	0.9361	0.9849	0.9505	0.06231	0.5158	0.6103	0.3406	0.3676	0.3441	0.32
0.33	0.9322	0.9839	0.9474	0.06599	0.5299	0.6250	0.3510	0.3793	0.3536	0.33
0.34	0.9282	0.9830	0.9443	0.06975	0.5439	0.6394	0.3615	0.3910	0.3629	0.34
0.35	0.9241	0.9820	0.9411	0.07358	0.5577	0.6535	0.3719	0.4027	0.3722	0.35
0.36	0.9200	0.9809	0.9378	0.07750	0.5714	0.6672	0.3824	0.4144	0.3813	0.36
0.37	0.9157	0.9799	0.9345	0.08148	0.5848	0.6806	0.3928	0.4262	0.3902	0.37
0.38	0.9113	0.9788	0.9311	0.08554	0.5981	0.6936	0.4032	0.4379	0.3991	0.38
0.39	0.9069	0.9777	0.9276	0.08966	0.6112	0.7063	0.4135	0.4497	0.4078	0.39
0.40	0.9023	0.9766	0.9240	0.09384	0.6241	0.7187	0.4239	0.4615	0.4164	0.40
0.41	0.8977	0.9754	0.9203	0.09809	0.6368	0.7307	0.4342	0.4733	0.4249	0.41
0.42	0.8930	0.9742	0.9166	0.1024	0.6493	0.7424	0.4446	0.4852	0.4333	0.42
0.43	0.8882	0.9730	0.9128	0.1067	0.6616	0.7538	0.4549	0.4970	0.4415	0.43
0.44	0.8833	0.9718	0.9090	0.1112	0.6737	0.7648	0.4651	0.5089	0.4495	0.44
0.45	0.8784	0.9705	0.9051	0.1156	0.6856	0.7755	0.4754	0.5208	0.4575	0.45
0.46	0.8734	0.9692	0.9011	0.1201	0.6973	0.7859	0.4856	0.5327	0.4653	0.46
0.47	0.8683	0.9679	0.8970	0.1247	0.7088	0.7960	0.4959	0.5447	0.4729	0.47
0.48	0.8631	0.9666	0.8929	0.1293	0.7200	0.8058	0.5061	0.5567	0.4805	0.48
0.49	0.8579	0.9652	0.8888	0.1339	0.7311	0.8152	0.5163	0.5687	0.4878	0.49
0.50	0.8525	0.9639	0.8845	0.1385	0.7419	0.8244	0.5264	0.5807	0.4951	0.50
0.51	0.8472	0.9625	0.8802	0.1432	0.7525	0.8332	0.5365	0.5927	0.5021	0.51
0.52	0.8417	0.9610	0.8759	0.1479	0.7629	0.8418	0.5467	0.6048	0.5091	0.52
0.53	0.8362	0.9596	0.8715	0.1527	0.7731	0.8500	0.5568	0.6169	0.5159	0.53
0.54	0.8307	0.9581	0.8670	0.1574	0.7831	0.8580	0.5668	0.6290	0.5225	0.54
0.55	0.8251	0.9566	0.8625	0.1622	0.7928	0.8657	0.5769	0.6412	0.5290	0.55
0.56	0.8194	0.9551	0.8579	0.1670	0.8023	0.8731	0.5869	0.6533	0.5353	0.56
0.57	0.8137	0.9535	0.8533	0.1718	0.8116	0.8802	0.5969	0.6655	0.5415	0.57
0.58	0.8079	0.9520	0.8487	0.1767	0.8206	0.8870	0.6069	0.6778	0.5476	0.58
0.59	0.8021	0.9504	0.8440	0.1815	0.8295	0.8936	0.6168	0.6900	0.5535	0.59
0.60	0.7962	0.9488	0.8392	0.1863	0.8381	0.9000	0.6267	0.7023	0.5592	0.60
0.61	0.7903	0.9471	0.8344	0.1911	0.8464	0.9060	0.6366	0.7147	0.5648	0.61
0.62	0.7843	0.9455	0.8296	0.1960	0.8546	0.9119	0.6465	0.7270	0.5702	0.62
0.63	0.7783	0.9438	0.8247	0.2008	0.8625	0.9175	0.6563	0.7394	0.5755	0.63
0.64	0.7723	0.9421	0.8198	0.2056	0.8701	0.9228	0.6662	0.7518	0.5806	0.64
0.65	0.7662	0.9404	0.8148	0.2104	0.8776	0.9279	0.6760	0.7642	0.5856	0.65
0.66	0.7601	0.9387	0.8098	0.2152	0.8848	0.9328	0.6857	0.7767	0.5904	0.66
0.67	0.7540	0.9369	0.8048	0.2200	0.8918	0.9375	0.6955	0.7892	0.5951	0.67
0.68	0.7478	0.9351	0.7997	0.2248	0.8985	0.9419	0.7052	0.8018	0.5996	0.68
0.69	0.7416	0.9333	0.7946	0.2295	0.9051	0.9462	0.7149	0.8143	0.6039	0.69
0.70	0.7354	0.9315	0.7895	0.2342	0.9114	0.9502	0.7245	0.8269	0.6081	0.70
0.71	0.7292	0.9297	0.7843	0.2389	0.9174	0.9541	0.7341	0.8396	0.6122	0.71
0.72	0.7229	0.9279	0.7791	0.2436	0.9233	0.9577	0.7437	0.8522	0.6161	0.72
0.73	0.7166	0.9260	0.7739	0.2482	0.9289	0.9612	0.7533	0.8650	0.6198	0.73
0.74	0.7103	0.9241	0.7686	0.2528	0.9343	0.9644	0.7628	0.8777	0.6234	0.74
0.75	0.7040	0.9222	0.7634	0.2574	0.9395	0.9675	0.7724	0.8905	0.6269	0.75
0.76	0.6976	0.9203	0.7581	0.2619	0.9444	0.9705	0.7818	0.9033	0.6302	0.76
0.77	0.6913	0.9183	0.7528	0.2664	0.9491	0.9732	0.7913	0.9161	0.6333	0.77
0.78	0.6849	0.9164	0.7474	0.2709	0.9536	0.9758	0.8007	0.9290	0.6363	0.78
0.79	0.6786	0.9144	0.7421	0.2753	0.9579	0.9782	0.8101	0.9420	0.6392	0.79
0.80	0.6722	0.9124	0.7367	0.2796	0.9620	0.9805	0.8195	0.9549	0.6419	0.80

TABLE 1.1.2
ONE-DIMENSIONAL COMPRESSIBLE FLOW FUNCTIONS OF A PERFECT GAS
FOR AN ISENTROPIC FLOW PROCESS

M	p/p^0	T/T^0	ρ/ρ^0	$\frac{\rho V^2}{2g_c p^0}$	A^*/A	F^*/F	V/a^*	$\frac{\rho V}{p} \sqrt{\frac{RT^0}{g_c}}$	$\frac{\rho V}{p^0} \sqrt{\frac{RT^0}{g_c}}$	M
0.80	0.6722	0.9124	0.7367	0.2796	0.9620	0.9805	0.8195	0.9549	0.6419	0.80
0.81	0.6658	0.9104	0.7313	0.2839	0.9658	0.9826	0.8288	0.9679	0.6444	0.81
0.82	0.6594	0.9084	0.7259	0.2882	0.9694	0.9846	0.8381	0.9810	0.6469	0.82
0.83	0.6530	0.9063	0.7205	0.2924	0.9728	0.9864	0.8474	0.9940	0.6491	0.83
0.84	0.6466	0.9043	0.7151	0.2966	0.9760	0.9881	0.8566	1.007	0.6513	0.84
0.85	0.6403	0.9022	0.7097	0.3007	0.9790	0.9897	0.8658	1.020	0.6533	0.85
0.86	0.6339	0.9001	0.7042	0.3047	0.9818	0.9911	0.8750	1.034	0.6551	0.86
0.87	0.6275	0.8980	0.6987	0.3087	0.9844	0.9925	0.8841	1.047	0.6568	0.87
0.88	0.6211	0.8959	0.6933	0.3127	0.9867	0.9937	0.8932	1.060	0.6584	0.88
0.89	0.6148	0.8938	0.6878	0.3165	0.9889	0.9947	0.9023	1.073	0.6599	0.89
0.90	0.6084	0.8917	0.6823	0.3203	0.9909	0.9957	0.9114	1.087	0.6612	0.90
0.91	0.6021	0.8895	0.6769	0.3241	0.9926	0.9966	0.9204	1.100	0.6624	0.91
0.92	0.5957	0.8873	0.6714	0.3278	0.9942	0.9973	0.9294	1.114	0.6634	0.92
0.93	0.5894	0.8852	0.6659	0.3314	0.9956	0.9980	0.9383	1.127	0.6643	0.93
0.94	0.5831	0.8830	0.6604	0.3349	0.9968	0.9985	0.9472	1.141	0.6651	0.94
0.95	0.5769	0.8808	0.6549	0.3384	0.9978	0.9990	0.9561	1.154	0.6658	0.95
0.96	0.5706	0.8785	0.6495	0.3418	0.9986	0.9994	0.9649	1.168	0.6663	0.96
0.97	0.5643	0.8763	0.6440	0.3451	0.9992	0.9996	0.9738	1.181	0.6667	0.97
0.98	0.5581	0.8741	0.6385	0.3484	0.9996	0.9998	0.9825	1.195	0.6670	0.98
0.99	0.5519	0.8718	0.6330	0.3516	0.9999	1.0000	0.9913	1.209	0.6672	0.99
1.00	0.5457	0.8696	0.6276	0.3547	1.0000	1.0000	1.000	1.223	0.6673	1.00
1.01	0.5394	0.8673	0.6221	0.3578	0.9999	1.0000	1.009	1.237	0.6672	1.01
1.02	0.5334	0.8650	0.6167	0.3607	0.9997	0.9999	1.017	1.250	0.6670	1.02
1.03	0.5273	0.8627	0.6113	0.3636	0.9992	0.9997	1.026	1.264	0.6667	1.03
1.04	0.5213	0.8604	0.6058	0.3665	0.9986	0.9994	1.035	1.278	0.6664	1.04
1.05	0.5152	0.8581	0.6004	0.3692	0.9979	0.9991	1.043	1.292	0.6658	1.05
1.06	0.5092	0.8558	0.5950	0.3719	0.9970	0.9987	1.052	1.306	0.6652	1.06
1.07	0.5032	0.8534	0.5896	0.3745	0.9959	0.9983	1.060	1.321	0.6645	1.07
1.08	0.4972	0.8511	0.5842	0.3770	0.9947	0.9978	1.068	1.335	0.6637	1.08
1.09	0.4913	0.8487	0.5789	0.3794	0.9933	0.9973	1.077	1.349	0.6628	1.09
1.10	0.4854	0.8464	0.5735	0.3818	0.9918	0.9967	1.085	1.363	0.6618	1.10
1.11	0.4796	0.8440	0.5682	0.3841	0.9901	0.9960	1.094	1.378	0.6606	1.11
1.12	0.4737	0.8416	0.5629	0.3863	0.9883	0.9953	1.102	1.392	0.6594	1.12
1.13	0.4680	0.8393	0.5576	0.3884	0.9863	0.9946	1.110	1.406	0.6581	1.13
1.14	0.4622	0.8369	0.5523	0.3904	0.9842	0.9938	1.118	1.421	0.6567	1.14
1.15	0.4565	0.8345	0.5470	0.3924	0.9820	0.9929	1.127	1.435	0.6552	1.15
1.16	0.4508	0.8321	0.5418	0.3943	0.9796	0.9921	1.135	1.450	0.6537	1.16
1.17	0.4452	0.8296	0.5366	0.3961	0.9771	0.9912	1.143	1.465	0.6520	1.17
1.18	0.4396	0.8272	0.5314	0.3978	0.9745	0.9902	1.151	1.479	0.6502	1.18
1.19	0.4340	0.8248	0.5262	0.3995	0.9718	0.9892	1.159	1.494	0.6484	1.19
1.20	0.4285	0.8224	0.5211	0.4011	0.9689	0.9882	1.167	1.509	0.6465	1.20
1.21	0.4230	0.8199	0.5159	0.4026	0.9659	0.9871	1.175	1.524	0.6445	1.21
1.22	0.4176	0.8175	0.5108	0.4040	0.9628	0.9861	1.183	1.538	0.6425	1.22
1.23	0.4122	0.8150	0.5057	0.4053	0.9596	0.9849	1.191	1.553	0.6403	1.23
1.24	0.4068	0.8126	0.5007	0.4066	0.9563	0.9838	1.199	1.568	0.6381	1.24
1.25	0.4015	0.8101	0.4957	0.4078	0.9529	0.9826	1.207	1.583	0.6358	1.25
1.26	0.3963	0.8077	0.4906	0.4089	0.9494	0.9814	1.214	1.599	0.6335	1.26
1.27	0.3911	0.8052	0.4857	0.4100	0.9457	0.9802	1.222	1.614	0.6310	1.27
1.28	0.3859	0.8027	0.4807	0.4109	0.9420	0.9790	1.230	1.629	0.6286	1.28
1.29	0.3807	0.8002	0.4758	0.4118	0.9382	0.9777	1.238	1.644	0.6260	1.29
1.30	0.3757	0.7978	0.4709	0.4127	0.9343	0.9764	1.245	1.659	0.6234	1.30
1.31	0.3706	0.7953	0.4660	0.4134	0.9303	0.9751	1.253	1.675	0.6207	1.31
1.32	0.3656	0.7928	0.4612	0.4141	0.9262	0.9738	1.260	1.690	0.6180	1.32
1.33	0.3607	0.7903	0.4564	0.4147	0.9220	0.9725	1.268	1.706	0.6152	1.33
1.34	0.3558	0.7878	0.4516	0.4152	0.9178	0.9711	1.275	1.721	0.6124	1.34
1.35	0.3509	0.7853	0.4468	0.4157	0.9134	0.9697	1.283	1.737	0.6095	1.35
1.36	0.3461	0.7828	0.4421	0.4161	0.9090	0.9684	1.290	1.753	0.6066	1.36
1.37	0.3413	0.7803	0.4374	0.4164	0.9045	0.9670	1.298	1.768	0.6036	1.37
1.38	0.3366	0.7778	0.4328	0.4167	0.9000	0.9656	1.305	1.784	0.6005	1.38
1.39	0.3319	0.7753	0.4281	0.4169	0.8954	0.9641	1.313	1.800	0.5974	1.39
1.40	0.3273	0.7728	0.4235	0.4170	0.8907	0.9627	1.320	1.816	0.5943	1.40
1.41	0.3227	0.7703	0.4190	0.4170	0.8859	0.9613	1.327	1.832	0.5911	1.41
1.42	0.3182	0.7678	0.4144	0.4170	0.8811	0.9598	1.334	1.848	0.5879	1.42
1.43	0.3137	0.7653	0.4099	0.4170	0.8762	0.9583	1.342	1.864	0.5847	1.43
1.44	0.3093	0.7628	0.4055	0.4168	0.8713	0.9569	1.349	1.880	0.5814	1.44
1.45	0.3049	0.7602	0.4010	0.4166	0.8663	0.9554	1.356	1.896	0.5781	1.45
1.46	0.3005	0.7577	0.3966	0.4164	0.8613	0.9539	1.363	1.912	0.5747	1.46
1.47	0.2962	0.7552	0.3922	0.4161	0.8562	0.9524	1.370	1.929	0.5713	1.47
1.48	0.2920	0.7527	0.3879	0.4157	0.8511	0.9509	1.377	1.945	0.5679	1.48
1.49	0.2878	0.7502	0.3836	0.4153	0.8459	0.9494	1.384	1.961	0.5644	1.49
1.50	0.2836	0.7477	0.3793	0.4148	0.8407	0.9479	1.391	1.978	0.5610	1.50
1.51	0.2795	0.7451	0.3751	0.4142	0.8354	0.9464	1.398	1.994	0.5575	1.51
1.52	0.2754	0.7426	0.3709	0.4136	0.8301	0.9449	1.405	2.011	0.5539	1.52
1.53	0.2714	0.7401	0.3667	0.4130	0.8248	0.9434	1.412	2.028	0.5504	1.53
1.54	0.2674	0.7376	0.3626	0.4123	0.8194	0.9419	1.418	2.044	0.5468	1.54
1.55	0.2635	0.7351	0.3585	0.4115	0.8140	0.9404	1.425	2.061	0.5432	1.55
1.56	0.2596	0.7326	0.3544	0.4107	0.8086	0.9389	1.432	2.078	0.5396	1.56
1.57	0.2558	0.7301	0.3504	0.4098	0.8032	0.9373	1.439	2.095	0.5359	1.57
1.58	0.2520	0.7276	0.3464	0.4089	0.7977	0.9358	1.445	2.112	0.5323	1.58
1.59	0.2483	0.7251	0.3424	0.4080	0.7922	0.9343	1.452	2.129	0.5286	1.59
1.60	0.2446	0.7225	0.3385	0.4070	0.7866	0.9328	1.458	2.146	0.5249	1.60

TABLE 1.1.2
ONE-DIMENSIONAL COMPRESSIBLE FLOW FUNCTIONS OF A PERFECT GAS
FOR AN ISENTROPIC FLOW PROCESS

PERFECT GAS 9
 ISENTROPIC
 $k = 1.30$

M	p/p^0	T/T^0	ρ/ρ^0	$\frac{\rho V^2}{2g_c p^0}$	A^*/A	F^*/F	V/a^*	$\frac{pV}{p^0} \sqrt{\frac{RT^0}{g_c}}$	$\frac{pV}{p^0} \sqrt{\frac{RT^0}{g_c}}$	M
1.60	0.2446	0.7225	0.3385	0.4070	0.7866	0.9328	1.458	2.146	0.5249	1.60
1.62	0.2373	0.7175	0.3307	0.4048	0.7755	0.9297	1.472	2.181	0.5175	1.62
1.64	0.2302	0.7125	0.3231	0.4025	0.7643	0.9267	1.485	2.215	0.5100	1.64
1.66	0.2233	0.7075	0.3156	0.4000	0.7531	0.9237	1.497	2.250	0.5025	1.66
1.68	0.2166	0.7026	0.3083	0.3973	0.7418	0.9207	1.510	2.285	0.4950	1.68
1.70	0.2100	0.6976	0.3011	0.3945	0.7305	0.9177	1.523	2.321	0.4874	1.70
1.72	0.2036	0.6926	0.2940	0.3916	0.7191	0.9147	1.535	2.356	0.4798	1.72
1.74	0.1974	0.6877	0.2871	0.3885	0.7078	0.9117	1.547	2.392	0.4723	1.74
1.76	0.1914	0.6828	0.2803	0.3853	0.6964	0.9088	1.560	2.429	0.4647	1.76
1.78	0.1855	0.6778	0.2736	0.3819	0.6851	0.9058	1.572	2.465	0.4572	1.78
1.80	0.1797	0.6729	0.2671	0.3785	0.6738	0.9029	1.583	2.502	0.4496	1.80
1.82	0.1741	0.6681	0.2607	0.3749	0.6625	0.9000	1.595	2.539	0.4421	1.82
1.84	0.1687	0.6632	0.2544	0.3713	0.6513	0.8972	1.607	2.576	0.4346	1.84
1.86	0.1634	0.6584	0.2482	0.3675	0.6402	0.8943	1.618	2.614	0.4271	1.86
1.88	0.1583	0.6535	0.2422	0.3637	0.6290	0.8915	1.630	2.652	0.4197	1.88
1.90	0.1533	0.6487	0.2363	0.3597	0.6180	0.8887	1.641	2.690	0.4124	1.90
1.92	0.1485	0.6439	0.2306	0.3558	0.6070	0.8859	1.652	2.728	0.4050	1.92
1.94	0.1438	0.6392	0.2249	0.3517	0.5961	0.8832	1.663	2.767	0.3978	1.94
1.96	0.1392	0.6344	0.2194	0.3476	0.5853	0.8805	1.674	2.806	0.3905	1.96
1.98	0.1348	0.6297	0.2140	0.3434	0.5746	0.8778	1.685	2.845	0.3834	1.98
2.00	0.1305	0.6250	0.2087	0.3392	0.5640	0.8751	1.696	2.884	0.3763	2.00
2.05	0.1203	0.6134	0.1961	0.3285	0.5378	0.8686	1.722	2.984	0.3589	2.05
2.10	0.1108	0.6019	0.1841	0.3176	0.5124	0.8623	1.747	3.086	0.3419	2.10
2.15	0.1020	0.5905	0.1728	0.3066	0.4878	0.8561	1.772	3.190	0.3255	2.15
2.20	0.09393	0.5794	0.1621	0.2955	0.4639	0.8501	1.796	3.295	0.3096	2.20
2.25	0.08645	0.5684	0.1521	0.2845	0.4409	0.8443	1.819	3.403	0.2942	2.25
2.30	0.07955	0.5576	0.1427	0.2735	0.4187	0.8387	1.842	3.512	0.2794	2.30
2.35	0.07318	0.5469	0.1338	0.2627	0.3973	0.8332	1.864	3.623	0.2651	2.35
2.40	0.06731	0.5365	0.1255	0.2520	0.3769	0.8280	1.885	3.736	0.2515	2.40
2.45	0.06190	0.5262	0.1176	0.2415	0.3572	0.8229	1.906	3.851	0.2384	2.45
2.50	0.05692	0.5161	0.1103	0.2312	0.3385	0.8179	1.926	3.968	0.2258	2.50
2.55	0.05234	0.5062	0.1034	0.2212	0.3205	0.8131	1.946	4.086	0.2139	2.55
2.60	0.04813	0.4965	0.09693	0.2115	0.3034	0.8085	1.965	4.207	0.2025	2.60
2.65	0.04426	0.4870	0.09087	0.2020	0.2872	0.8040	1.983	4.330	0.1916	2.65
2.70	0.04070	0.4777	0.08520	0.1928	0.2717	0.7997	2.001	4.454	0.1813	2.70
2.75	0.03742	0.4685	0.07988	0.1840	0.2569	0.7956	2.019	4.581	0.1714	2.75
2.80	0.03442	0.4596	0.07490	0.1754	0.2429	0.7915	2.036	4.709	0.1621	2.80
2.85	0.03166	0.4508	0.07023	0.1672	0.2296	0.7876	2.052	4.840	0.1532	2.85
2.90	0.02913	0.4422	0.06587	0.1592	0.2170	0.7838	2.068	4.972	0.1448	2.90
2.95	0.02680	0.4338	0.06178	0.1516	0.2051	0.7802	2.084	5.107	0.1369	2.95
3.00	0.02466	0.4255	0.05796	0.1443	0.1938	0.7767	2.099	5.244	0.1293	3.00
3.05	0.02270	0.4175	0.05438	0.1373	0.1831	0.7732	2.113	5.382	0.1222	3.05
3.10	0.02090	0.4096	0.05103	0.1306	0.1730	0.7699	2.128	5.523	0.1154	3.10
3.15	0.01925	0.4019	0.04789	0.1241	0.1634	0.7668	2.141	5.666	0.1090	3.15
3.20	0.01773	0.3943	0.04496	0.1180	0.1544	0.7637	2.155	5.810	0.1030	3.20
3.25	0.01634	0.3869	0.04222	0.1122	0.1458	0.7607	2.168	5.957	0.09731	3.25
3.30	0.01506	0.3797	0.03965	0.1066	0.1378	0.7578	2.181	6.106	0.09193	3.30
3.35	0.01388	0.3727	0.03724	0.1012	0.1301	0.7550	2.193	6.257	0.08684	3.35
3.40	0.01280	0.3658	0.03499	0.09618	0.1230	0.7523	2.205	6.410	0.08205	3.40
3.45	0.01181	0.3590	0.03289	0.09135	0.1162	0.7497	2.217	6.565	0.07752	3.45
3.50	0.01090	0.3524	0.03092	0.08676	0.1098	0.7471	2.228	6.722	0.07325	3.50
3.55	0.01006	0.3460	0.02907	0.08240	0.1037	0.7447	2.239	6.881	0.06922	3.55
3.60	0.009288	0.3397	0.02734	0.07824	0.09804	0.7423	2.250	7.043	0.06542	3.60
3.65	0.008580	0.3335	0.02573	0.07430	0.09266	0.7400	2.260	7.206	0.06183	3.65
3.70	0.007929	0.3275	0.02421	0.07055	0.08760	0.7377	2.271	7.372	0.05845	3.70
3.75	0.007330	0.3216	0.02279	0.06700	0.08282	0.7355	2.281	7.539	0.05526	3.75
3.80	0.006778	0.3159	0.02146	0.06362	0.07831	0.7334	2.290	7.709	0.05226	3.80
3.85	0.006271	0.3102	0.02021	0.06042	0.07406	0.7314	2.300	7.881	0.04942	3.85
3.90	0.005803	0.3047	0.01904	0.05738	0.07006	0.7294	2.309	8.055	0.04675	3.90
3.95	0.005373	0.2994	0.01795	0.05449	0.06628	0.7275	2.318	8.231	0.04423	3.95
4.00	0.004977	0.2941	0.01692	0.05176	0.06272	0.7256	2.326	8.410	0.04185	4.00
4.05	0.004611	0.2890	0.01596	0.04916	0.05936	0.7238	2.335	8.590	0.03961	4.05
4.10	0.004274	0.2840	0.01505	0.04670	0.05619	0.7221	2.343	8.772	0.03749	4.10
4.15	0.003963	0.2791	0.01420	0.04437	0.05320	0.7204	2.351	8.957	0.03550	4.15
4.20	0.003677	0.2743	0.01341	0.04216	0.05038	0.7187	2.359	9.144	0.03362	4.20
4.25	0.003412	0.2696	0.01266	0.04006	0.04772	0.7171	2.366	9.333	0.03184	4.25
4.30	0.003168	0.2650	0.01195	0.03807	0.04522	0.7155	2.374	9.524	0.03017	4.30
4.35	0.002942	0.2605	0.01129	0.03619	0.04285	0.7140	2.381	9.717	0.02859	4.35
4.40	0.002734	0.2561	0.01067	0.03440	0.04061	0.7126	2.388	9.912	0.02710	4.40
4.45	0.002541	0.2519	0.01009	0.03271	0.03850	0.7111	2.395	10.11	0.02569	4.45
4.50	0.002363	0.2477	0.009542	0.03111	0.03651	0.7097	2.402	10.31	0.02436	4.50
4.55	0.002199	0.2436	0.009026	0.02959	0.03463	0.7084	2.408	10.51	0.02311	4.55
4.60	0.002046	0.2396	0.008541	0.02814	0.03286	0.7070	2.415	10.72	0.02193	4.60
4.65	0.001905	0.2357	0.008084	0.02678	0.03118	0.7058	2.421	10.92	0.02081	4.65
4.70	0.001774	0.2318	0.007654	0.02548	0.02960	0.7045	2.427	11.13	0.01975	4.70
4.75	0.001653	0.2281	0.007249	0.02425	0.02810	0.7033	2.433	11.34	0.01875	4.75
4.80	0.001541	0.2244	0.006868	0.02308	0.02669	0.7021	2.438	11.55	0.01781	4.80
4.85	0.001437	0.2208	0.006509	0.02198	0.02535	0.7010	2.444	11.77	0.01691	4.85
4.90	0.001341	0.2173	0.006171	0.02093	0.02409	0.6998	2.450	11.98	0.01607	4.90
4.95	0.001252	0.2139	0.005852	0.01993	0.02289	0.6987	2.455	12.20	0.01527	4.95
5.00	0.001169	0.2105	0.005551	0.01899	0.02176	0.6977	2.460	12.42	0.01452	5.00

TABLE 1.1.2
ONE-DIMENSIONAL COMPRESSIBLE FLOW FUNCTIONS OF A PERFECT GAS
FOR AN ISENTROPIC FLOW PROCESS

M	p/p^0	T/T^0	ρ/ρ^0	$\frac{\rho V^2}{2g_c p^0}$	A^*/A	F^*/F	V/a^*	$\frac{\rho V}{p} \sqrt{\frac{RT^0}{g_c}}$	$\frac{\rho V}{p^0} \sqrt{\frac{RT^0}{g_c}}$	M
5.00	0.001169	0.2105	0.005551	0.01899	0.02176	0.6977	2.460	12.42	0.01452	5.00
5.05	0.001092	0.2072	0.005267	0.01809	0.02069	0.6966	2.465	12.65	0.01381	5.05
5.10	0.001020	0.2040	0.004999	0.01724	0.01968	0.6956	2.470	12.87	0.01313	5.10
5.15	0.0009534	0.2009	0.004747	0.01644	0.01872	0.6946	2.475	13.10	0.01249	5.15
5.20	0.0008916	0.1978	0.004508	0.01567	0.01781	0.6937	2.480	13.33	0.01189	5.20
5.25	0.0008341	0.1948	0.004283	0.01494	0.01696	0.6927	2.485	13.56	0.01131	5.25
5.30	0.0007806	0.1918	0.004070	0.01425	0.01614	0.6918	2.489	13.80	0.01077	5.30
5.35	0.0007308	0.1889	0.003869	0.01360	0.01537	0.6909	2.494	14.03	0.01026	5.35
5.40	0.0006845	0.1861	0.003679	0.01297	0.01464	0.6901	2.498	14.27	0.009770	5.40
5.45	0.0006413	0.1833	0.003499	0.01238	0.01395	0.6892	2.502	14.51	0.009308	5.45
5.50	0.0006011	0.1806	0.003329	0.01182	0.01329	0.6884	2.506	14.76	0.008871	5.50
5.55	0.0005637	0.1779	0.003168	0.01129	0.01267	0.6876	2.510	15.00	0.008456	5.55
5.60	0.0005287	0.1753	0.003016	0.01078	0.01208	0.6868	2.514	15.25	0.008063	5.60
5.65	0.0004961	0.1728	0.002872	0.01029	0.01152	0.6860	2.518	15.50	0.007689	5.65
5.70	0.0004657	0.1703	0.002735	0.009835	0.01099	0.6852	2.522	15.75	0.007335	5.70
5.75	0.0004373	0.1678	0.002606	0.009398	0.01049	0.6845	2.526	16.00	0.006999	5.75
5.80	0.0004108	0.1654	0.002484	0.008983	0.01001	0.6838	2.530	16.26	0.006680	5.80
5.85	0.0003860	0.1630	0.002368	0.008587	0.009557	0.6831	2.533	16.52	0.006377	5.85
5.90	0.0003629	0.1607	0.002258	0.008211	0.009126	0.6824	2.537	16.78	0.006089	5.90
5.95	0.0003413	0.1585	0.002154	0.007853	0.008716	0.6817	2.540	17.04	0.005816	5.95
6.00	0.0003210	0.1562	0.002055	0.007512	0.008327	0.6811	2.543	17.31	0.005556	6.00
6.05	0.0003021	0.1541	0.001961	0.007188	0.007957	0.6804	2.547	17.57	0.005309	6.05
6.10	0.0002844	0.1519	0.001872	0.006879	0.007605	0.6798	2.550	17.84	0.005074	6.10
6.15	0.0002678	0.1498	0.001787	0.006584	0.007270	0.6792	2.553	18.11	0.004851	6.15
6.20	0.0002523	0.1478	0.001707	0.006304	0.006952	0.6786	2.556	18.39	0.004639	6.20
6.25	0.0002377	0.1458	0.001631	0.006036	0.006650	0.6780	2.559	18.66	0.004437	6.25
6.30	0.0002241	0.1438	0.001558	0.005782	0.006362	0.6774	2.562	18.94	0.004245	6.30
6.35	0.0002113	0.1419	0.001489	0.005539	0.006088	0.6769	2.565	19.22	0.004062	6.35
6.40	0.0001993	0.1400	0.001424	0.005307	0.005827	0.6763	2.568	19.50	0.003888	6.40
6.45	0.0001881	0.1381	0.001362	0.005086	0.005578	0.6758	2.571	19.79	0.003722	6.45
6.50	0.0001775	0.1363	0.001303	0.004876	0.005341	0.6752	2.573	20.08	0.003564	6.50
6.55	0.0001676	0.1345	0.001246	0.004675	0.005116	0.6747	2.576	20.36	0.003414	6.55
6.60	0.0001583	0.1327	0.001193	0.004483	0.004901	0.6742	2.579	20.66	0.003270	6.60
6.65	0.0001496	0.1310	0.001142	0.004300	0.004696	0.6737	2.581	20.95	0.003134	6.65
6.70	0.0001414	0.1293	0.001093	0.004125	0.004501	0.6732	2.584	21.24	0.003003	6.70
6.75	0.0001336	0.1276	0.001047	0.003958	0.004315	0.6728	2.586	21.54	0.002879	6.75
6.80	0.0001264	0.1260	0.001003	0.003799	0.004137	0.6723	2.589	21.84	0.002761	6.80
6.85	0.0001196	0.1244	0.0009611	0.003647	0.003968	0.6718	2.591	22.14	0.002648	6.85
6.90	0.0001131	0.1228	0.0009211	0.003501	0.003806	0.6714	2.593	22.45	0.002540	6.90
6.95	0.0001071	0.1213	0.0008830	0.003362	0.003652	0.6710	2.596	22.75	0.002437	6.95
7.00	0.0001014	0.1198	0.0008467	0.003229	0.003505	0.6705	2.598	23.06	0.002338	7.00
7.05	0.00009603	0.1183	0.0008120	0.003103	0.003364	0.6701	2.600	23.37	0.002245	7.05
7.10	0.00009098	0.1168	0.0007789	0.002981	0.003230	0.6697	2.602	23.69	0.002155	7.10
7.15	0.00008622	0.1154	0.0007474	0.002865	0.003101	0.6693	2.604	24.00	0.002069	7.15
7.20	0.00008173	0.1139	0.0007173	0.002754	0.002979	0.6689	2.606	24.32	0.001988	7.20
7.25	0.00007749	0.1126	0.0006885	0.002648	0.002862	0.6685	2.608	24.64	0.001909	7.25
7.30	0.00007350	0.1112	0.0006611	0.002546	0.002750	0.6681	2.610	24.96	0.001835	7.30
7.35	0.00006973	0.1098	0.0006348	0.002449	0.002643	0.6677	2.612	25.28	0.001763	7.35
7.40	0.00006618	0.1085	0.0006098	0.002356	0.002540	0.6674	2.614	25.61	0.001695	7.40
7.45	0.00006282	0.1072	0.0005858	0.002266	0.002442	0.6670	2.616	25.94	0.001630	7.45
7.50	0.00005965	0.1060	0.0005630	0.002181	0.002348	0.6667	2.618	26.27	0.001567	7.50
7.55	0.00005665	0.1047	0.0005411	0.002099	0.002259	0.6663	2.620	26.60	0.001507	7.55
7.60	0.00005382	0.1035	0.0005202	0.002021	0.002173	0.6660	2.622	26.94	0.001450	7.60
7.65	0.00005115	0.1023	0.0005002	0.001946	0.002091	0.6656	2.623	27.28	0.001395	7.65
7.70	0.00004862	0.1011	0.0004810	0.001874	0.002012	0.6653	2.625	27.61	0.001343	7.70
7.75	0.00004622	0.09991	0.0004627	0.001805	0.001937	0.6650	2.627	27.96	0.001292	7.75
7.80	0.00004396	0.09876	0.0004452	0.001739	0.001865	0.6647	2.629	28.30	0.001244	7.80
7.85	0.00004182	0.09762	0.0004284	0.001675	0.001795	0.6644	2.630	28.65	0.001198	7.85
7.90	0.00003979	0.09651	0.0004123	0.001614	0.001729	0.6640	2.632	28.99	0.001154	7.90
7.95	0.00003787	0.09542	0.0003970	0.001556	0.001666	0.6637	2.633	29.34	0.001111	7.95
8.00	0.00003605	0.09434	0.0003822	0.001500	0.001605	0.6635	2.635	29.70	0.001071	8.00
8.05	0.00003433	0.09328	0.0003681	0.001446	0.001546	0.6632	2.637	30.05	0.001032	8.05
8.10	0.00003270	0.09224	0.0003546	0.001395	0.001490	0.6629	2.638	30.41	0.000995	8.10
8.15	0.00003116	0.09121	0.0003416	0.001345	0.001437	0.6626	2.640	30.77	0.000959	8.15
8.20	0.00002969	0.09020	0.0003292	0.001298	0.001385	0.6623	2.641	31.13	0.000924	8.20
8.25	0.00002830	0.08921	0.0003172	0.001252	0.001336	0.6621	2.642	31.49	0.000891	8.25
8.30	0.00002698	0.08823	0.0003053	0.001208	0.001288	0.6618	2.644	31.86	0.000860	8.30
8.35	0.00002573	0.08727	0.0002943	0.001166	0.001243	0.6615	2.645	32.23	0.000829	8.35
8.40	0.00002454	0.08633	0.0002843	0.001126	0.001199	0.6613	2.647	32.60	0.000800	8.40
8.45	0.00002341	0.08539	0.0002742	0.001087	0.001157	0.6610	2.648	32.97	0.000772	8.45
8.50	0.00002234	0.08448	0.0002645	0.001049	0.001117	0.6608	2.649	33.34	0.000745	8.50
8.55	0.00002132	0.08357	0.0002552	0.001014	0.001078	0.6605	2.651	33.72	0.000719	8.55
8.60	0.00002036	0.08269	0.0002463	0.000979	0.001041	0.6603	2.652	34.10	0.000694	8.60
8.65	0.00001945	0.08181	0.0002377	0.000946	0.001005	0.6600	2.653	34.48	0.000671	8.65
8.70	0.00001857	0.08095	0.0002295	0.000914	0.0009705	0.6598	2.654	34.86	0.000648	8.70
8.75	0.00001774	0.08010	0.0002215	0.000883	0.0009374	0.6596	2.656	35.25	0.000626	8.75
8.80	0.00001695	0.07926	0.0002139	0.000854	0.0009056	0.6594	2.657	35.64	0.000604	8.80
8.85	0.00001620	0.07844	0.0002066	0.000825	0.0008751	0.6591	2.658	36.03	0.000584	8.85
8.90	0.00001549	0.07763	0.0001996	0.000798	0.0008457	0.6589	2.659	36.42	0.000564	8.90
8.95	0.00001481	0.07683	0.0001928	0.000771	0.0008174	0.6587	2.660	36.81	0.000545	8.95
9.00	0.00001416	0.07605	0.0001863	0.000746	0.0007901	0.6585	2.662	37.21	0.000527	9.00

TABLE 1.1.3
ONE-DIMENSIONAL COMPRESSIBLE FLOW FUNCTIONS OF A PERFECT GAS
FOR AN ISENTROPIC FLOW PROCESS

PERFECT GAS 11
 ISENTROPIC
 $k = 1.40$

M	p/p^0	T/T^0	ρ/ρ^0	$\frac{\rho V^2}{2g_c p^0}$	A^*/A	F^*/F	V/a^*	$\frac{\rho V}{p} \sqrt{\frac{RT^0}{g_c}}$	$\frac{\rho V}{p^0} \sqrt{\frac{RT^0}{g_c}}$	M
0.00	1.0000	1.0000	1.0000	0.000000	0.00000	0.00000	0.0000	0.00000	0.00000	0.00
0.01	0.9999	1.0000	0.9999	0.000070	0.01728	0.02191	0.0110	0.01183	0.01183	0.01
0.02	0.9997	0.9999	0.9998	0.000280	0.03455	0.04380	0.0219	0.02367	0.02366	0.02
0.03	0.9994	0.9998	0.9996	0.000630	0.05181	0.06565	0.0329	0.03550	0.03548	0.03
0.04	0.9989	0.9997	0.9992	0.001119	0.06905	0.08745	0.0438	0.04734	0.04728	0.04
0.05	0.9983	0.9995	0.9988	0.001747	0.08627	0.1092	0.0548	0.05918	0.05907	0.05
0.06	0.9975	0.9993	0.9982	0.002514	0.1035	0.1308	0.0657	0.07102	0.07084	0.06
0.07	0.9966	0.9990	0.9976	0.003418	0.1206	0.1524	0.0766	0.08287	0.08258	0.07
0.08	0.9955	0.9987	0.9968	0.004460	0.1377	0.1738	0.0876	0.09472	0.09429	0.08
0.09	0.9944	0.9984	0.9960	0.005638	0.1548	0.1951	0.0985	0.1066	0.1060	0.09
0.10	0.9930	0.9980	0.9950	0.006951	0.1718	0.2163	0.1094	0.1184	0.1176	0.10
0.11	0.9916	0.9976	0.9940	0.008399	0.1887	0.2373	0.1204	0.1303	0.1292	0.11
0.12	0.9900	0.9971	0.9928	0.009979	0.2056	0.2581	0.1313	0.1422	0.1408	0.12
0.13	0.9883	0.9966	0.9916	0.01169	0.2224	0.2787	0.1422	0.1541	0.1523	0.13
0.14	0.9864	0.9961	0.9903	0.01353	0.2391	0.2991	0.1531	0.1660	0.1637	0.14
0.15	0.9844	0.9955	0.9888	0.01550	0.2557	0.3193	0.1639	0.1779	0.1751	0.15
0.16	0.9823	0.9949	0.9873	0.01760	0.2723	0.3393	0.1748	0.1898	0.1864	0.16
0.17	0.9800	0.9943	0.9857	0.01983	0.2887	0.3590	0.1857	0.2017	0.1977	0.17
0.18	0.9776	0.9936	0.9840	0.02217	0.3051	0.3785	0.1965	0.2137	0.2089	0.18
0.19	0.9751	0.9928	0.9822	0.02464	0.3213	0.3977	0.2074	0.2256	0.2200	0.19
0.20	0.9725	0.9921	0.9803	0.02723	0.3374	0.4166	0.2182	0.2376	0.2311	0.20
0.21	0.9697	0.9913	0.9783	0.02994	0.3534	0.4352	0.2290	0.2496	0.2420	0.21
0.22	0.9668	0.9904	0.9762	0.03276	0.3693	0.4536	0.2398	0.2616	0.2529	0.22
0.23	0.9638	0.9895	0.9740	0.03569	0.3851	0.4716	0.2506	0.2736	0.2637	0.23
0.24	0.9607	0.9886	0.9718	0.03874	0.4007	0.4894	0.2614	0.2856	0.2744	0.24
0.25	0.9575	0.9877	0.9694	0.04189	0.4162	0.5068	0.2722	0.2976	0.2850	0.25
0.26	0.9541	0.9867	0.9670	0.04515	0.4315	0.5239	0.2829	0.3097	0.2955	0.26
0.27	0.9506	0.9856	0.9645	0.04851	0.4467	0.5407	0.2936	0.3218	0.3059	0.27
0.28	0.9470	0.9846	0.9619	0.05197	0.4618	0.5571	0.3043	0.3339	0.3162	0.28
0.29	0.9433	0.9835	0.9592	0.05553	0.4767	0.5732	0.3150	0.3460	0.3264	0.29
0.30	0.9395	0.9823	0.9564	0.05919	0.4914	0.5889	0.3257	0.3581	0.3365	0.30
0.31	0.9355	0.9811	0.9535	0.06293	0.5059	0.6044	0.3364	0.3703	0.3464	0.31
0.32	0.9315	0.9799	0.9506	0.06677	0.5203	0.6194	0.3470	0.3825	0.3563	0.32
0.33	0.9274	0.9787	0.9476	0.07069	0.5345	0.6341	0.3576	0.3947	0.3660	0.33
0.34	0.9231	0.9774	0.9445	0.07470	0.5486	0.6485	0.3682	0.4069	0.3756	0.34
0.35	0.9188	0.9761	0.9413	0.07878	0.5624	0.6625	0.3788	0.4192	0.3851	0.35
0.36	0.9143	0.9747	0.9380	0.08295	0.5761	0.6762	0.3893	0.4314	0.3945	0.36
0.37	0.9098	0.9733	0.9347	0.08719	0.5896	0.6895	0.3999	0.4437	0.4037	0.37
0.38	0.9052	0.9719	0.9313	0.09149	0.6029	0.7025	0.4104	0.4561	0.4128	0.38
0.39	0.9004	0.9705	0.9278	0.09587	0.6160	0.7151	0.4209	0.4684	0.4218	0.39
0.40	0.8956	0.9690	0.9243	0.1003	0.6289	0.7273	0.4313	0.4808	0.4306	0.40
0.41	0.8907	0.9675	0.9207	0.1048	0.6416	0.7393	0.4418	0.4932	0.4393	0.41
0.42	0.8857	0.9659	0.9170	0.1094	0.6541	0.7508	0.4522	0.5056	0.4479	0.42
0.43	0.8807	0.9643	0.9132	0.1140	0.6663	0.7621	0.4626	0.5181	0.4563	0.43
0.44	0.8755	0.9627	0.9094	0.1186	0.6784	0.7730	0.4729	0.5306	0.4645	0.44
0.45	0.8703	0.9611	0.9055	0.1234	0.6903	0.7835	0.4833	0.5431	0.4727	0.45
0.46	0.8650	0.9594	0.9016	0.1281	0.7019	0.7938	0.4936	0.5557	0.4806	0.46
0.47	0.8596	0.9577	0.8976	0.1329	0.7134	0.8037	0.5038	0.5683	0.4885	0.47
0.48	0.8541	0.9559	0.8935	0.1378	0.7246	0.8133	0.5141	0.5809	0.4961	0.48
0.49	0.8486	0.9542	0.8894	0.1426	0.7356	0.8225	0.5243	0.5935	0.5037	0.49
0.50	0.8430	0.9524	0.8852	0.1475	0.7464	0.8315	0.5345	0.6062	0.5111	0.50
0.51	0.8374	0.9506	0.8809	0.1525	0.7569	0.8401	0.5447	0.6189	0.5183	0.51
0.52	0.8317	0.9487	0.8766	0.1574	0.7672	0.8485	0.5548	0.6317	0.5253	0.52
0.53	0.8259	0.9468	0.8723	0.1624	0.7773	0.8565	0.5649	0.6445	0.5323	0.53
0.54	0.8201	0.9449	0.8679	0.1674	0.7872	0.8643	0.5750	0.6573	0.5390	0.54
0.55	0.8142	0.9430	0.8634	0.1724	0.7968	0.8717	0.5851	0.6702	0.5456	0.55
0.56	0.8082	0.9410	0.8589	0.1774	0.8063	0.8789	0.5951	0.6831	0.5521	0.56
0.57	0.8022	0.9390	0.8544	0.1825	0.8154	0.8858	0.6051	0.6960	0.5584	0.57
0.58	0.7962	0.9370	0.8498	0.1875	0.8244	0.8925	0.6150	0.7090	0.5645	0.58
0.59	0.7901	0.9349	0.8451	0.1925	0.8331	0.8988	0.6249	0.7220	0.5705	0.59
0.60	0.7840	0.9328	0.8405	0.1976	0.8416	0.9049	0.6348	0.7350	0.5763	0.60
0.61	0.7778	0.9307	0.8357	0.2026	0.8499	0.9108	0.6447	0.7481	0.5819	0.61
0.62	0.7716	0.9286	0.8310	0.2076	0.8579	0.9164	0.6545	0.7613	0.5874	0.62
0.63	0.7654	0.9265	0.8262	0.2127	0.8657	0.9218	0.6643	0.7744	0.5928	0.63
0.64	0.7591	0.9243	0.8213	0.2177	0.8732	0.9269	0.6740	0.7877	0.5979	0.64
0.65	0.7528	0.9221	0.8164	0.2226	0.8806	0.9318	0.6837	0.8009	0.6030	0.65
0.66	0.7465	0.9199	0.8115	0.2276	0.8877	0.9365	0.6934	0.8142	0.6078	0.66
0.67	0.7401	0.9176	0.8066	0.2326	0.8945	0.9410	0.7031	0.8276	0.6125	0.67
0.68	0.7338	0.9153	0.8016	0.2375	0.9012	0.9453	0.7127	0.8410	0.6171	0.68
0.69	0.7274	0.9131	0.7966	0.2424	0.9076	0.9493	0.7223	0.8544	0.6215	0.69
0.70	0.7209	0.9107	0.7916	0.2473	0.9138	0.9532	0.7318	0.8679	0.6257	0.70
0.71	0.7145	0.9084	0.7865	0.2521	0.9197	0.9568	0.7413	0.8814	0.6298	0.71
0.72	0.7080	0.9061	0.7814	0.2569	0.9254	0.9603	0.7508	0.8950	0.6337	0.72
0.73	0.7016	0.9037	0.7763	0.2617	0.9309	0.9636	0.7602	0.9086	0.6374	0.73
0.74	0.6951	0.9013	0.7712	0.2664	0.9362	0.9667	0.7696	0.9223	0.6410	0.74
0.75	0.6886	0.8989	0.7660	0.2711	0.9412	0.9696	0.7789	0.9360	0.6445	0.75
0.76	0.6821	0.8964	0.7609	0.2758	0.9461	0.9723	0.7883	0.9498	0.6478	0.76
0.77	0.6756	0.8940	0.7557	0.2804	0.9507	0.9749	0.7975	0.9636	0.6510	0.77
0.78	0.6691	0.8915	0.7505	0.2849	0.9551	0.9774	0.8068	0.9774	0.6540	0.78
0.79	0.6625	0.8890	0.7452	0.2894	0.9592	0.9797	0.8160	0.9914	0.6568	0.79
0.80	0.6560	0.8865	0.7400	0.2939	0.9632	0.9818	0.8251	1.005	0.6595	0.80

TABLE 1.1.3
ONE-DIMENSIONAL COMPRESSIBLE FLOW FUNCTIONS OF A PERFECT GAS
FOR AN ISENTROPIC FLOW PROCESS

M	p/p^0	T/T^0	ρ/ρ^0	$\frac{\rho V^2}{2g_c p^0}$	A^*/A	F^*/F	V/a^*	$\frac{\rho V}{p} \sqrt{\frac{RT^0}{g_c}}$	$\frac{\rho V}{p^0} \sqrt{\frac{RT^0}{g_c}}$	M
0.80	0.6560	0.8865	0.7400	0.2939	0.9632	0.9818	0.8251	1.005	0.6595	0.80
0.81	0.6495	0.8840	0.7347	0.2983	0.9669	0.9838	0.8343	1.019	0.6621	0.81
0.82	0.6430	0.8815	0.7295	0.3026	0.9704	0.9857	0.8433	1.033	0.6645	0.82
0.83	0.6365	0.8789	0.7242	0.3069	0.9737	0.9874	0.8524	1.048	0.6668	0.83
0.84	0.6300	0.8763	0.7189	0.3112	0.9769	0.9890	0.8614	1.062	0.6689	0.84
0.85	0.6235	0.8737	0.7136	0.3153	0.9797	0.9904	0.8704	1.076	0.6709	0.85
0.86	0.6170	0.8711	0.7083	0.3195	0.9824	0.9918	0.8793	1.090	0.6727	0.86
0.87	0.6106	0.8685	0.7030	0.3235	0.9849	0.9930	0.8882	1.105	0.6744	0.87
0.88	0.6041	0.8659	0.6977	0.3275	0.9872	0.9941	0.8970	1.119	0.6760	0.88
0.89	0.5977	0.8632	0.6924	0.3314	0.9893	0.9951	0.9058	1.133	0.6774	0.89
0.90	0.5913	0.8606	0.6870	0.3352	0.9912	0.9960	0.9146	1.148	0.6787	0.90
0.91	0.5849	0.8579	0.6817	0.3390	0.9929	0.9968	0.9233	1.162	0.6799	0.91
0.92	0.5785	0.8552	0.6764	0.3427	0.9944	0.9975	0.9320	1.177	0.6809	0.92
0.93	0.5721	0.8525	0.6711	0.3464	0.9958	0.9981	0.9407	1.192	0.6818	0.93
0.94	0.5658	0.8498	0.6658	0.3499	0.9969	0.9986	0.9493	1.207	0.6826	0.94
0.95	0.5595	0.8471	0.6604	0.3534	0.9979	0.9991	0.9578	1.221	0.6833	0.95
0.96	0.5532	0.8444	0.6551	0.3569	0.9986	0.9994	0.9663	1.236	0.6838	0.96
0.97	0.5469	0.8416	0.6498	0.3602	0.9992	0.9997	0.9748	1.251	0.6842	0.97
0.98	0.5407	0.8389	0.6445	0.3635	0.9997	0.9999	0.9833	1.266	0.6845	0.98
0.99	0.5345	0.8361	0.6392	0.3667	0.9999	1.0000	0.9916	1.281	0.6847	0.99
1.00	0.5283	0.8333	0.6339	0.3698	1.0000	1.0000	1.000	1.296	0.6847	1.00
1.01	0.5221	0.8306	0.6287	0.3728	0.9999	1.0000	1.008	1.311	0.6847	1.01
1.02	0.5160	0.8278	0.6234	0.3758	0.9997	0.9999	1.017	1.327	0.6845	1.02
1.03	0.5099	0.8250	0.6181	0.3787	0.9993	0.9997	1.025	1.342	0.6842	1.03
1.04	0.5039	0.8222	0.6129	0.3815	0.9987	0.9995	1.033	1.357	0.6838	1.04
1.05	0.4979	0.8193	0.6077	0.3842	0.9980	0.9992	1.041	1.373	0.6833	1.05
1.06	0.4919	0.8165	0.6024	0.3869	0.9971	0.9988	1.049	1.388	0.6827	1.06
1.07	0.4860	0.8137	0.5972	0.3895	0.9961	0.9984	1.057	1.404	0.6820	1.07
1.08	0.4800	0.8108	0.5920	0.3919	0.9949	0.9980	1.065	1.419	0.6812	1.08
1.09	0.4742	0.8080	0.5869	0.3944	0.9936	0.9975	1.073	1.435	0.6803	1.09
1.10	0.4684	0.8052	0.5817	0.3967	0.9921	0.9970	1.081	1.450	0.6793	1.10
1.11	0.4626	0.8023	0.5766	0.3990	0.9905	0.9964	1.089	1.466	0.6783	1.11
1.12	0.4568	0.7994	0.5714	0.4011	0.9888	0.9957	1.097	1.482	0.6771	1.12
1.13	0.4511	0.7966	0.5663	0.4032	0.9870	0.9951	1.105	1.498	0.6758	1.13
1.14	0.4455	0.7937	0.5612	0.4052	0.9850	0.9943	1.113	1.514	0.6744	1.14
1.15	0.4398	0.7908	0.5562	0.4072	0.9828	0.9936	1.120	1.530	0.6730	1.15
1.16	0.4343	0.7879	0.5511	0.4090	0.9806	0.9928	1.128	1.546	0.6715	1.16
1.17	0.4287	0.7851	0.5461	0.4108	0.9782	0.9920	1.136	1.562	0.6698	1.17
1.18	0.4232	0.7822	0.5411	0.4125	0.9758	0.9911	1.143	1.579	0.6681	1.18
1.19	0.4178	0.7793	0.5361	0.4141	0.9732	0.9902	1.151	1.595	0.6664	1.19
1.20	0.4124	0.7764	0.5311	0.4157	0.9705	0.9893	1.158	1.611	0.6645	1.20
1.21	0.4070	0.7735	0.5262	0.4171	0.9676	0.9884	1.166	1.628	0.6626	1.21
1.22	0.4017	0.7706	0.5213	0.4185	0.9647	0.9874	1.173	1.644	0.6606	1.22
1.23	0.3964	0.7677	0.5164	0.4198	0.9617	0.9864	1.181	1.661	0.6585	1.23
1.24	0.3912	0.7648	0.5115	0.4211	0.9586	0.9854	1.188	1.678	0.6564	1.24
1.25	0.3861	0.7619	0.5067	0.4223	0.9553	0.9843	1.195	1.694	0.6541	1.25
1.26	0.3809	0.7590	0.5019	0.4233	0.9520	0.9832	1.202	1.711	0.6519	1.26
1.27	0.3759	0.7561	0.4971	0.4244	0.9486	0.9821	1.210	1.728	0.6495	1.27
1.28	0.3708	0.7532	0.4923	0.4253	0.9451	0.9810	1.217	1.745	0.6471	1.28
1.29	0.3658	0.7503	0.4876	0.4262	0.9415	0.9799	1.224	1.762	0.6447	1.29
1.30	0.3609	0.7474	0.4829	0.4270	0.9378	0.9788	1.231	1.779	0.6422	1.30
1.31	0.3560	0.7445	0.4782	0.4277	0.9341	0.9776	1.238	1.796	0.6396	1.31
1.32	0.3512	0.7416	0.4736	0.4283	0.9302	0.9764	1.245	1.814	0.6369	1.32
1.33	0.3464	0.7387	0.4690	0.4289	0.9263	0.9752	1.252	1.831	0.6343	1.33
1.34	0.3417	0.7358	0.4644	0.4294	0.9223	0.9740	1.259	1.848	0.6315	1.34
1.35	0.3370	0.7329	0.4598	0.4299	0.9182	0.9728	1.266	1.866	0.6287	1.35
1.36	0.3323	0.7300	0.4553	0.4303	0.9141	0.9716	1.273	1.883	0.6259	1.36
1.37	0.3277	0.7271	0.4508	0.4306	0.9099	0.9703	1.280	1.901	0.6230	1.37
1.38	0.3232	0.7242	0.4463	0.4308	0.9056	0.9691	1.286	1.919	0.6201	1.38
1.39	0.3187	0.7213	0.4418	0.4310	0.9013	0.9678	1.293	1.937	0.6172	1.39
1.40	0.3142	0.7184	0.4374	0.4311	0.8969	0.9666	1.300	1.954	0.6141	1.40
1.41	0.3098	0.7155	0.4330	0.4312	0.8925	0.9653	1.307	1.972	0.6111	1.41
1.42	0.3055	0.7126	0.4287	0.4312	0.8880	0.9640	1.313	1.990	0.6080	1.42
1.43	0.3012	0.7097	0.4244	0.4311	0.8834	0.9627	1.320	2.008	0.6049	1.43
1.44	0.2969	0.7069	0.4201	0.4310	0.8788	0.9614	1.326	2.027	0.6017	1.44
1.45	0.2927	0.7040	0.4158	0.4308	0.8742	0.9601	1.333	2.045	0.5986	1.45
1.46	0.2886	0.7011	0.4116	0.4306	0.8695	0.9588	1.339	2.063	0.5953	1.46
1.47	0.2845	0.6982	0.4074	0.4303	0.8647	0.9575	1.346	2.082	0.5921	1.47
1.48	0.2804	0.6954	0.4032	0.4299	0.8599	0.9562	1.352	2.100	0.5888	1.48
1.49	0.2764	0.6925	0.3991	0.4295	0.8551	0.9549	1.358	2.119	0.5855	1.49
1.50	0.2724	0.6897	0.3950	0.4290	0.8502	0.9536	1.365	2.137	0.5822	1.50
1.51	0.2685	0.6868	0.3909	0.4285	0.8453	0.9522	1.371	2.156	0.5788	1.51
1.52	0.2646	0.6840	0.3869	0.4279	0.8404	0.9509	1.377	2.175	0.5754	1.52
1.53	0.2608	0.6811	0.3829	0.4273	0.8354	0.9496	1.383	2.194	0.5720	1.53
1.54	0.2570	0.6783	0.3789	0.4266	0.8304	0.9483	1.389	2.212	0.5686	1.54
1.55	0.2533	0.6754	0.3750	0.4259	0.8254	0.9469	1.395	2.232	0.5652	1.55
1.56	0.2496	0.6726	0.3710	0.4252	0.8203	0.9456	1.402	2.251	0.5617	1.56
1.57	0.2459	0.6698	0.3672	0.4243	0.8152	0.9443	1.408	2.270	0.5582	1.57
1.58	0.2423	0.6670	0.3633	0.4235	0.8101	0.9430	1.414	2.289	0.5547	1.58
1.59	0.2388	0.6642	0.3595	0.4226	0.8050	0.9416	1.419	2.308	0.5512	1.59
1.60	0.2353	0.6614	0.3557	0.4216	0.7998	0.9403	1.425	2.328	0.5477	1.60

TABLE 1.1.3
ONE-DIMENSIONAL COMPRESSIBLE FLOW FUNCTIONS OF A PERFECT GAS
FOR AN ISENTROPIC FLOW PROCESS

M	p/p^0	T/T^0	ρ/ρ^0	$\frac{\rho V^2}{2g_c p^0}$	A^*/A	F^*/F	V/a^*	$\frac{\rho V}{p} \sqrt{\frac{RT^0}{g_c}}$	$\frac{\rho V}{p^0} \sqrt{\frac{RT^0}{g_c}}$	M
1.60	0.2353	0.6614	0.3557	0.4216	0.7998	0.9403	1.425	2.328	0.5477	1.60
1.62	0.2284	0.6558	0.3483	0.4196	0.7895	0.9377	1.437	2.367	0.5406	1.62
1.64	0.2217	0.6502	0.3409	0.4174	0.7791	0.9350	1.449	2.406	0.5335	1.64
1.66	0.2151	0.6447	0.3337	0.4150	0.7686	0.9324	1.460	2.446	0.5263	1.66
1.68	0.2088	0.6392	0.3266	0.4125	0.7581	0.9298	1.471	2.486	0.5191	1.68
1.70	0.2026	0.6337	0.3197	0.4098	0.7476	0.9272	1.482	2.527	0.5119	1.70
1.72	0.1966	0.6283	0.3129	0.4071	0.7371	0.9246	1.493	2.568	0.5047	1.72
1.74	0.1907	0.6229	0.3062	0.4041	0.7265	0.9221	1.504	2.609	0.4975	1.74
1.76	0.1850	0.6175	0.2996	0.4011	0.7160	0.9195	1.515	2.650	0.4903	1.76
1.78	0.1794	0.6121	0.2931	0.3980	0.7054	0.9170	1.526	2.692	0.4830	1.78
1.80	0.1740	0.6068	0.2868	0.3947	0.6949	0.9145	1.536	2.734	0.4758	1.80
1.82	0.1688	0.6015	0.2806	0.3914	0.6845	0.9120	1.546	2.777	0.4687	1.82
1.84	0.1637	0.5963	0.2745	0.3879	0.6740	0.9095	1.556	2.819	0.4615	1.84
1.86	0.1587	0.5910	0.2686	0.3844	0.6636	0.9071	1.566	2.863	0.4544	1.86
1.88	0.1539	0.5859	0.2627	0.3808	0.6533	0.9047	1.576	2.906	0.4473	1.88
1.90	0.1492	0.5807	0.2570	0.3771	0.6430	0.9023	1.586	2.950	0.4403	1.90
1.92	0.1447	0.5756	0.2514	0.3734	0.6328	0.8999	1.596	2.994	0.4333	1.92
1.94	0.1403	0.5705	0.2459	0.3696	0.6226	0.8976	1.605	3.039	0.4263	1.94
1.96	0.1360	0.5655	0.2405	0.3657	0.6125	0.8953	1.615	3.084	0.4194	1.96
1.98	0.1318	0.5605	0.2352	0.3618	0.6025	0.8930	1.624	3.129	0.4126	1.98
2.00	0.1278	0.5556	0.2300	0.3579	0.5926	0.8907	1.633	3.175	0.4058	2.00
2.05	0.1182	0.5433	0.2176	0.3478	0.5682	0.8852	1.655	3.291	0.3891	2.05
2.10	0.1094	0.5313	0.2058	0.3376	0.5444	0.8798	1.677	3.409	0.3728	2.10
2.15	0.1011	0.5196	0.1946	0.3272	0.5212	0.8746	1.698	3.529	0.3569	2.15
2.20	0.09352	0.5081	0.1841	0.3169	0.4988	0.8696	1.718	3.652	0.3415	2.20
2.25	0.08648	0.4969	0.1740	0.3065	0.4770	0.8647	1.737	3.777	0.3266	2.25
2.30	0.07997	0.4859	0.1646	0.2961	0.4560	0.8600	1.756	3.904	0.3122	2.30
2.35	0.07396	0.4752	0.1556	0.2859	0.4357	0.8554	1.775	4.034	0.2983	2.35
2.40	0.06840	0.4647	0.1472	0.2758	0.4161	0.8510	1.792	4.166	0.2849	2.40
2.45	0.06327	0.4544	0.1392	0.2658	0.3973	0.8468	1.809	4.300	0.2721	2.45
2.50	0.05853	0.4444	0.1317	0.2561	0.3793	0.8427	1.826	4.437	0.2597	2.50
2.55	0.05415	0.4347	0.1246	0.2465	0.3619	0.8387	1.842	4.576	0.2478	2.55
2.60	0.05012	0.4252	0.1179	0.2371	0.3453	0.8349	1.857	4.718	0.2364	2.60
2.65	0.04639	0.4159	0.1115	0.2280	0.3294	0.8312	1.872	4.862	0.2255	2.65
2.70	0.04295	0.4068	0.1056	0.2192	0.3142	0.8276	1.887	5.009	0.2151	2.70
2.75	0.03978	0.3980	0.09994	0.2106	0.2996	0.8242	1.901	5.158	0.2052	2.75
2.80	0.03685	0.3894	0.09463	0.2022	0.2857	0.8209	1.914	5.309	0.1956	2.80
2.85	0.03415	0.3810	0.08962	0.1941	0.2724	0.8176	1.927	5.463	0.1865	2.85
2.90	0.03165	0.3729	0.08489	0.1863	0.2598	0.8146	1.940	5.619	0.1779	2.90
2.95	0.02935	0.3649	0.08043	0.1788	0.2477	0.8116	1.952	5.778	0.1696	2.95
3.00	0.02722	0.3571	0.07623	0.1715	0.2362	0.8087	1.964	5.940	0.1617	3.00
3.05	0.02526	0.3496	0.07226	0.1645	0.2252	0.8059	1.975	6.104	0.1542	3.05
3.10	0.02345	0.3422	0.06852	0.1577	0.2147	0.8032	1.987	6.270	0.1470	3.10
3.15	0.02177	0.3351	0.06499	0.1512	0.2048	0.8006	1.997	6.439	0.1402	3.15
3.20	0.02023	0.3281	0.06165	0.1450	0.1953	0.7981	2.008	6.610	0.1337	3.20
3.25	0.01880	0.3213	0.05851	0.1390	0.1863	0.7957	2.018	6.784	0.1275	3.25
3.30	0.01748	0.3147	0.05554	0.1332	0.1777	0.7934	2.028	6.961	0.1217	3.30
3.35	0.01625	0.3082	0.05274	0.1277	0.1695	0.7911	2.037	7.140	0.1161	3.35
3.40	0.01512	0.3019	0.05009	0.1224	0.1617	0.7889	2.047	7.321	0.1107	3.40
3.45	0.01408	0.2958	0.04759	0.1173	0.1543	0.7868	2.056	7.505	0.1057	3.45
3.50	0.01311	0.2899	0.04523	0.1124	0.1473	0.7847	2.064	7.692	0.1008	3.50
3.55	0.01221	0.2841	0.04300	0.1078	0.1406	0.7828	2.073	7.881	0.09627	3.55
3.60	0.01138	0.2784	0.04089	0.1033	0.1342	0.7808	2.081	8.073	0.09191	3.60
3.65	0.01062	0.2729	0.03890	0.09900	0.1282	0.7790	2.089	8.267	0.08776	3.65
3.70	0.009903	0.2675	0.03702	0.09490	0.1224	0.7772	2.096	8.464	0.08382	3.70
3.75	0.009242	0.2623	0.03524	0.09098	0.1169	0.7754	2.104	8.664	0.08007	3.75
3.80	0.008629	0.2572	0.03355	0.08722	0.1117	0.7738	2.111	8.866	0.07650	3.80
3.85	0.008060	0.2522	0.03195	0.08363	0.1068	0.7721	2.118	9.070	0.07311	3.85
3.90	0.007532	0.2474	0.03044	0.08019	0.1021	0.7705	2.125	9.277	0.06988	3.90
3.95	0.007042	0.2427	0.02902	0.07691	0.09756	0.7690	2.132	9.487	0.06681	3.95
4.00	0.006586	0.2381	0.02766	0.07376	0.09329	0.7675	2.138	9.699	0.06388	4.00
4.05	0.006163	0.2336	0.02638	0.07076	0.08923	0.7661	2.144	9.914	0.06110	4.05
4.10	0.005769	0.2293	0.02516	0.06788	0.08536	0.7647	2.150	10.13	0.05845	4.10
4.15	0.005403	0.2250	0.02401	0.06513	0.08168	0.7633	2.156	10.35	0.05593	4.15
4.20	0.005062	0.2208	0.02292	0.06251	0.07818	0.7620	2.162	10.57	0.05353	4.20
4.25	0.004745	0.2168	0.02189	0.05999	0.07484	0.7607	2.168	10.80	0.05124	4.25
4.30	0.004449	0.2129	0.02090	0.05759	0.07166	0.7595	2.173	11.03	0.04907	4.30
4.35	0.004174	0.2090	0.01997	0.05529	0.06863	0.7583	2.179	11.26	0.04699	4.35
4.40	0.003918	0.2053	0.01909	0.05309	0.06575	0.7571	2.184	11.49	0.04502	4.40
4.45	0.003678	0.2016	0.01825	0.05099	0.06300	0.7560	2.189	11.73	0.04314	4.45
4.50	0.003455	0.1980	0.01745	0.04898	0.06038	0.7549	2.194	11.97	0.04134	4.50
4.55	0.003247	0.1945	0.01669	0.04705	0.05788	0.7538	2.198	12.21	0.03963	4.55
4.60	0.003053	0.1911	0.01597	0.04521	0.05550	0.7527	2.203	12.45	0.03800	4.60
4.65	0.002871	0.1878	0.01529	0.04345	0.05323	0.7517	2.208	12.70	0.03645	4.65
4.70	0.002701	0.1846	0.01464	0.04177	0.05107	0.7507	2.212	12.94	0.03497	4.70
4.75	0.002543	0.1814	0.01402	0.04016	0.04900	0.7498	2.216	13.20	0.03355	4.75
4.80	0.002394	0.1783	0.01343	0.03861	0.04703	0.7489	2.220	13.45	0.03220	4.80
4.85	0.002255	0.1753	0.01287	0.03714	0.04515	0.7479	2.224	13.71	0.03091	4.85
4.90	0.002126	0.1724	0.01233	0.03572	0.04335	0.7471	2.228	13.97	0.02968	4.90
4.95	0.002004	0.1695	0.01182	0.03437	0.04164	0.7462	2.232	14.23	0.02851	4.95
5.00	0.001890	0.1667	0.01134	0.03308	0.04000	0.7454	2.236	14.49	0.02739	5.00

PERFECT GAS
ISENTROPIC
 $k = 1.40$

TABLE 1.1.3
ONE-DIMENSIONAL COMPRESSIBLE FLOW FUNCTIONS OF A PERFECT GAS
FOR AN ISENTROPIC FLOW PROCESS

M	p/p^0	T/T^0	ρ/ρ^0	$\frac{\rho V^2}{2g_c p^0}$	A^*/A	F^*/F	V/c^*	$\frac{\rho V}{p} \sqrt{\frac{RT^0}{g_c}}$	$\frac{\rho V}{p^0} \sqrt{\frac{RT^0}{g_c}}$	M
5.00	0.001890	0.1667	0.01134	0.03308	0.04000	0.7454	2.236	14.49	0.02739	5.00
5.05	0.001783	0.1639	0.01088	0.03183	0.03844	0.7445	2.240	14.76	0.02632	5.05
5.10	0.001683	0.1612	0.01044	0.03065	0.03694	0.7437	2.243	15.03	0.02530	5.10
5.15	0.001589	0.1586	0.01002	0.02951	0.03551	0.7430	2.247	15.30	0.02432	5.15
5.20	0.001501	0.1561	0.009620	0.02842	0.03415	0.7422	2.250	15.58	0.02338	5.20
5.25	0.001419	0.1536	0.009239	0.02737	0.03284	0.7415	2.254	15.85	0.02249	5.25
5.30	0.001341	0.1511	0.008875	0.02637	0.03160	0.7408	2.257	16.13	0.02164	5.30
5.35	0.001268	0.1487	0.008528	0.02541	0.03040	0.7401	2.260	16.42	0.02082	5.35
5.40	0.001200	0.1464	0.008197	0.02449	0.02926	0.7394	2.263	16.70	0.02004	5.40
5.45	0.001135	0.1441	0.007880	0.02361	0.02817	0.7387	2.266	16.99	0.01929	5.45
5.50	0.001075	0.1418	0.007578	0.02276	0.02712	0.7381	2.269	17.28	0.01857	5.50
5.55	0.001018	0.1397	0.007289	0.02195	0.02612	0.7374	2.272	17.57	0.01789	5.55
5.60	0.0009643	0.1375	0.007012	0.02117	0.02516	0.7368	2.275	17.87	0.01723	5.60
5.65	0.0009139	0.1354	0.006748	0.02042	0.02425	0.7362	2.278	18.17	0.01660	5.65
5.70	0.0008663	0.1334	0.006496	0.01970	0.02337	0.7356	2.280	18.47	0.01600	5.70
5.75	0.0008216	0.1314	0.006254	0.01901	0.02252	0.7350	2.283	18.77	0.01542	5.75
5.80	0.0007794	0.1294	0.006023	0.01835	0.02172	0.7345	2.286	19.08	0.01487	5.80
5.85	0.0007396	0.1275	0.005802	0.01772	0.02094	0.7339	2.288	19.39	0.01434	5.85
5.90	0.0007021	0.1256	0.005590	0.01711	0.02020	0.7334	2.291	19.70	0.01383	5.90
5.95	0.0006668	0.1238	0.005388	0.01652	0.01949	0.7329	2.293	20.01	0.01334	5.95
6.00	0.0006334	0.1220	0.005194	0.01596	0.01880	0.7323	2.295	20.33	0.01288	6.00
6.05	0.0006018	0.1202	0.005008	0.01542	0.01815	0.7318	2.298	20.65	0.01243	6.05
6.10	0.0005721	0.1185	0.004829	0.01490	0.01752	0.7314	2.300	20.97	0.01200	6.10
6.15	0.0005439	0.1168	0.004658	0.01440	0.01692	0.7309	2.302	21.30	0.01158	6.15
6.20	0.0005173	0.1151	0.004495	0.01392	0.01634	0.7304	2.304	21.62	0.01119	6.20
6.25	0.0004922	0.1135	0.004338	0.01346	0.01578	0.7299	2.306	21.95	0.01081	6.25
6.30	0.0004684	0.1119	0.004187	0.01301	0.01525	0.7295	2.308	22.29	0.01044	6.30
6.35	0.0004460	0.1103	0.004042	0.01259	0.01473	0.7291	2.310	22.62	0.01009	6.35
6.40	0.0004247	0.1088	0.003904	0.01218	0.01424	0.7286	2.312	22.96	0.009750	6.40
6.45	0.0004045	0.1073	0.003771	0.01178	0.01377	0.7282	2.314	23.30	0.009426	6.45
6.50	0.0003855	0.1058	0.003643	0.01140	0.01331	0.7278	2.316	23.64	0.009113	6.50
6.55	0.0003674	0.1044	0.003520	0.01103	0.01287	0.7274	2.318	23.99	0.008813	6.55
6.60	0.0003503	0.1030	0.003402	0.01068	0.01245	0.7270	2.320	24.34	0.008525	6.60
6.65	0.0003341	0.1016	0.003289	0.01034	0.01204	0.7266	2.322	24.69	0.008247	6.65
6.70	0.0003187	0.1002	0.003180	0.01001	0.01165	0.7262	2.324	25.04	0.007980	6.70
6.75	0.0003041	0.09889	0.003075	0.009698	0.01128	0.7259	2.325	25.40	0.007723	6.75
6.80	0.0002902	0.09758	0.002974	0.009395	0.01092	0.7255	2.327	25.76	0.007476	6.80
6.85	0.0002771	0.09630	0.002878	0.009102	0.01057	0.7252	2.329	26.12	0.007238	6.85
6.90	0.0002646	0.09504	0.002785	0.008820	0.01024	0.7248	2.330	26.48	0.007008	6.90
6.95	0.0002528	0.09380	0.002695	0.008548	0.009913	0.7245	2.332	26.85	0.006788	6.95
7.00	0.0002416	0.09259	0.002609	0.008285	0.009602	0.7241	2.333	27.22	0.006575	7.00
7.05	0.0002309	0.09140	0.002526	0.008032	0.009303	0.7238	2.335	27.59	0.006370	7.05
7.10	0.0002207	0.09024	0.002446	0.007788	0.009015	0.7235	2.336	27.97	0.006173	7.10
7.15	0.0002111	0.08909	0.002369	0.007553	0.008737	0.7232	2.338	28.34	0.005982	7.15
7.20	0.0002019	0.08797	0.002295	0.007326	0.008469	0.7229	2.339	28.72	0.005799	7.20
7.25	0.0001931	0.08686	0.002224	0.007107	0.008211	0.7226	2.341	29.11	0.005622	7.25
7.30	0.0001848	0.08578	0.002155	0.006895	0.007961	0.7223	2.342	29.49	0.005451	7.30
7.35	0.0001769	0.08471	0.002089	0.006681	0.007721	0.7220	2.343	29.88	0.005287	7.35
7.40	0.0001694	0.08367	0.002025	0.006469	0.007490	0.7217	2.345	30.27	0.005128	7.40
7.45	0.0001623	0.08264	0.001963	0.006260	0.007266	0.7214	2.346	30.66	0.004975	7.45
7.50	0.0001554	0.08163	0.001904	0.006061	0.007050	0.7211	2.347	31.06	0.004827	7.50
7.55	0.0001489	0.08064	0.001847	0.005862	0.006842	0.7209	2.349	31.46	0.004685	7.55
7.60	0.0001427	0.07967	0.001791	0.005671	0.006641	0.7206	2.350	31.86	0.004547	7.60
7.65	0.0001368	0.07871	0.001738	0.005485	0.006447	0.7203	2.351	32.26	0.004414	7.65
7.70	0.0001312	0.07777	0.001687	0.005304	0.006259	0.7201	2.352	32.67	0.004286	7.70
7.75	0.0001258	0.07685	0.001637	0.005129	0.006078	0.7198	2.353	33.08	0.004162	7.75
7.80	0.0001207	0.07594	0.001589	0.004954	0.005903	0.7196	2.355	33.49	0.004042	7.80
7.85	0.0001158	0.07505	0.001543	0.004785	0.005734	0.7194	2.356	33.90	0.003926	7.85
7.90	0.0001111	0.07417	0.001498	0.004621	0.005571	0.7191	2.357	34.32	0.003814	7.90
7.95	0.0001067	0.07331	0.001455	0.004462	0.005413	0.7189	2.358	34.74	0.003706	7.95
8.00	0.0001024	0.07246	0.001414	0.004308	0.005260	0.7187	2.359	35.16	0.003602	8.00
8.05	0.00009836	0.07163	0.001373	0.004156	0.005113	0.7184	2.360	35.59	0.003501	8.05
8.10	0.00009448	0.07081	0.001334	0.004009	0.004970	0.7182	2.361	36.02	0.003403	8.10
8.15	0.00009077	0.07001	0.001297	0.003862	0.004832	0.7180	2.362	36.45	0.003308	8.15
8.20	0.00008723	0.06921	0.001260	0.003720	0.004698	0.7178	2.363	36.88	0.003217	8.20
8.25	0.00008384	0.06843	0.001225	0.003582	0.004569	0.7176	2.364	37.31	0.003129	8.25
8.30	0.00008060	0.06767	0.001191	0.003448	0.004444	0.7174	2.365	37.75	0.003043	8.30
8.35	0.00007750	0.06691	0.001158	0.003317	0.004323	0.7172	2.366	38.19	0.002960	8.35
8.40	0.00007454	0.06617	0.001126	0.003188	0.004206	0.7170	2.367	38.64	0.002880	8.40
8.45	0.00007170	0.06544	0.001096	0.003062	0.004092	0.7168	2.368	39.08	0.002802	8.45
8.50	0.00006898	0.06472	0.001066	0.002939	0.003983	0.7166	2.369	39.53	0.002727	8.50
8.55	0.00006638	0.06402	0.001037	0.002819	0.003876	0.7164	2.370	39.98	0.002654	8.55
8.60	0.00006389	0.06332	0.001009	0.002702	0.003773	0.7162	2.371	40.44	0.002584	8.60
8.65	0.00006150	0.06264	0.0009820	0.002587	0.003674	0.7160	2.372	40.89	0.002515	8.65
8.70	0.00005922	0.06197	0.0009558	0.002474	0.003577	0.7158	2.372	41.35	0.002449	8.70
8.75	0.00005703	0.06130	0.0009305	0.002362	0.003483	0.7157	2.373	41.82	0.002385	8.75
8.80	0.00005494	0.06065	0.0009059	0.002252	0.003393	0.7155	2.374	42.28	0.002323	8.80
8.85	0.00005293	0.06001	0.0008821	0.002144	0.003305	0.7153	2.375	42.75	0.002263	8.85
8.90	0.00005100	0.05938	0.0008590	0.002038	0.003219	0.7152	2.376	43.22	0.002204	8.90
8.95	0.00004915	0.05875	0.0008367	0.001934	0.003137	0.7150	2.376	43.69	0.002148	8.95
9.00	0.00004739	0.05814	0.0008150	0.001832	0.003056	0.7148	2.377	44.16	0.002093	9.00

TABLE 1.1.4
ONE-DIMENSIONAL COMPRESSIBLE FLOW FUNCTIONS OF A PERFECT GAS
FOR AN ISENTROPIC FLOW PROCESS

PERFECT GAS 15
ISENTROPIC
 $k = 1.50$

M	p/p^0	T/T^0	ρ/ρ^0	$\frac{pV^2}{2g_c p^0}$	A^*/A	F^*/F	V/a^*	$\frac{pV}{p^0} \sqrt{\frac{RT^0}{g_c}}$	$\frac{pV}{p^0} \sqrt{\frac{RT^0}{g_c}}$	M
0.00	1.0000	1.0000	1.0000	0.000000	0.00000	0.00000	0.0000	0.00000	0.00000	0.00
0.01	0.9999	1.0000	1.0000	0.000075	0.01747	0.02236	0.0112	0.01225	0.01225	0.01
0.02	0.9997	0.9999	0.9998	0.000300	0.03493	0.04470	0.0224	0.02450	0.02449	0.02
0.03	0.9993	0.9998	0.9996	0.000675	0.05238	0.06700	0.0335	0.03675	0.03672	0.03
0.04	0.9988	0.9996	0.9992	0.001199	0.06981	0.08925	0.0447	0.04900	0.04894	0.04
0.05	0.9981	0.9994	0.9988	0.001871	0.08721	0.1114	0.0559	0.06126	0.06114	0.05
0.06	0.9973	0.9991	0.9982	0.002693	0.1046	0.1335	0.0671	0.07352	0.07332	0.06
0.07	0.9963	0.9988	0.9976	0.003662	0.1219	0.1555	0.0782	0.08578	0.08547	0.07
0.08	0.9952	0.9984	0.9968	0.004777	0.1392	0.1773	0.0894	0.09806	0.09759	0.08
0.09	0.9939	0.9980	0.9960	0.006038	0.1564	0.1990	0.1005	0.1103	0.1097	0.09
0.10	0.9925	0.9975	0.9950	0.007444	0.1736	0.2206	0.1117	0.1226	0.1217	0.10
0.11	0.9910	0.9970	0.9940	0.008993	0.1907	0.2419	0.1228	0.1349	0.1337	0.11
0.12	0.9893	0.9964	0.9928	0.01068	0.2078	0.2631	0.1339	0.1472	0.1457	0.12
0.13	0.9874	0.9958	0.9916	0.01252	0.2247	0.2841	0.1450	0.1596	0.1575	0.13
0.14	0.9854	0.9951	0.9903	0.01449	0.2416	0.3049	0.1561	0.1719	0.1694	0.14
0.15	0.9833	0.9944	0.9888	0.01659	0.2584	0.3254	0.1672	0.1842	0.1812	0.15
0.16	0.9810	0.9936	0.9873	0.01884	0.2751	0.3456	0.1783	0.1966	0.1929	0.16
0.17	0.9786	0.9928	0.9857	0.02121	0.2917	0.3657	0.1894	0.2090	0.2045	0.17
0.18	0.9761	0.9920	0.9840	0.02372	0.3082	0.3854	0.2004	0.2213	0.2161	0.18
0.19	0.9734	0.9911	0.9822	0.02635	0.3245	0.4048	0.2115	0.2337	0.2275	0.19
0.20	0.9706	0.9901	0.9803	0.02912	0.3408	0.4240	0.2225	0.2462	0.2389	0.20
0.21	0.9676	0.9891	0.9783	0.03200	0.3569	0.4429	0.2335	0.2586	0.2502	0.21
0.22	0.9646	0.9880	0.9762	0.03501	0.3729	0.4614	0.2445	0.2711	0.2615	0.22
0.23	0.9614	0.9869	0.9741	0.03814	0.3888	0.4796	0.2555	0.2835	0.2726	0.23
0.24	0.9580	0.9858	0.9718	0.04139	0.4045	0.4975	0.2664	0.2960	0.2836	0.24
0.25	0.9546	0.9846	0.9695	0.04474	0.4201	0.5151	0.2774	0.3086	0.2945	0.25
0.26	0.9510	0.9834	0.9670	0.04821	0.4356	0.5323	0.2883	0.3211	0.3054	0.26
0.27	0.9473	0.9821	0.9645	0.05179	0.4508	0.5492	0.2992	0.3337	0.3161	0.27
0.28	0.9434	0.9808	0.9619	0.05547	0.4660	0.5657	0.3100	0.3463	0.3267	0.28
0.29	0.9395	0.9794	0.9592	0.05926	0.4809	0.5818	0.3209	0.3589	0.3372	0.29
0.30	0.9354	0.9780	0.9565	0.06314	0.4957	0.5976	0.3317	0.3715	0.3475	0.30
0.31	0.9313	0.9765	0.9536	0.06712	0.5103	0.6131	0.3425	0.3842	0.3578	0.31
0.32	0.9270	0.9750	0.9507	0.07119	0.5248	0.6282	0.3533	0.3969	0.3679	0.32
0.33	0.9226	0.9735	0.9477	0.07535	0.5390	0.6429	0.3640	0.4096	0.3779	0.33
0.34	0.9181	0.9719	0.9446	0.07960	0.5531	0.6572	0.3748	0.4224	0.3878	0.34
0.35	0.9135	0.9703	0.9415	0.08393	0.5670	0.6712	0.3855	0.4352	0.3975	0.35
0.36	0.9088	0.9686	0.9382	0.08833	0.5807	0.6848	0.3961	0.4480	0.4071	0.36
0.37	0.9040	0.9669	0.9349	0.09282	0.5942	0.6980	0.4068	0.4608	0.4166	0.37
0.38	0.8991	0.9652	0.9315	0.09737	0.6075	0.7109	0.4174	0.4737	0.4259	0.38
0.39	0.8941	0.9634	0.9281	0.1020	0.6206	0.7234	0.4280	0.4866	0.4351	0.39
0.40	0.8890	0.9615	0.9246	0.1067	0.6335	0.7356	0.4385	0.4996	0.4441	0.40
0.41	0.8838	0.9597	0.9210	0.1114	0.6462	0.7474	0.4491	0.5126	0.4530	0.41
0.42	0.8786	0.9578	0.9173	0.1162	0.6587	0.7588	0.4596	0.5256	0.4618	0.42
0.43	0.8732	0.9558	0.9136	0.1211	0.6709	0.7699	0.4700	0.5387	0.4704	0.43
0.44	0.8678	0.9538	0.9098	0.1260	0.6830	0.7807	0.4804	0.5518	0.4788	0.44
0.45	0.8623	0.9518	0.9060	0.1310	0.6948	0.7911	0.4908	0.5649	0.4871	0.45
0.46	0.8567	0.9498	0.9020	0.1360	0.7064	0.8012	0.5012	0.5781	0.4953	0.46
0.47	0.8511	0.9477	0.8981	0.1410	0.7178	0.8109	0.5115	0.5913	0.5032	0.47
0.48	0.8453	0.9455	0.8940	0.1461	0.7290	0.8203	0.5218	0.6046	0.5111	0.48
0.49	0.8396	0.9434	0.8900	0.1512	0.7399	0.8294	0.5321	0.6179	0.5187	0.49
0.50	0.8337	0.9412	0.8858	0.1563	0.7506	0.8381	0.5423	0.6312	0.5263	0.50
0.51	0.8278	0.9389	0.8816	0.1615	0.7611	0.8466	0.5525	0.6446	0.5336	0.51
0.52	0.8218	0.9367	0.8774	0.1667	0.7714	0.8547	0.5627	0.6580	0.5408	0.52
0.53	0.8158	0.9344	0.8731	0.1719	0.7814	0.8626	0.5728	0.6715	0.5478	0.53
0.54	0.8097	0.9321	0.8687	0.1771	0.7912	0.8701	0.5829	0.6850	0.5547	0.54
0.55	0.8036	0.9297	0.8643	0.1823	0.8007	0.8774	0.5929	0.6986	0.5614	0.55
0.56	0.7974	0.9273	0.8599	0.1875	0.8101	0.8844	0.6029	0.7122	0.5679	0.56
0.57	0.7911	0.9249	0.8554	0.1928	0.8191	0.8911	0.6129	0.7259	0.5743	0.57
0.58	0.7849	0.9224	0.8509	0.1980	0.8280	0.8975	0.6228	0.7396	0.5805	0.58
0.59	0.7785	0.9199	0.8463	0.2033	0.8366	0.9036	0.6327	0.7534	0.5865	0.59
0.60	0.7722	0.9174	0.8417	0.2085	0.8450	0.9096	0.6425	0.7672	0.5924	0.60
0.61	0.7658	0.9149	0.8370	0.2137	0.8532	0.9152	0.6523	0.7811	0.5981	0.61
0.62	0.7594	0.9123	0.8323	0.2189	0.8611	0.9206	0.6621	0.7950	0.6037	0.62
0.63	0.7529	0.9097	0.8276	0.2241	0.8688	0.9258	0.6718	0.8090	0.6091	0.63
0.64	0.7464	0.9071	0.8229	0.2293	0.8762	0.9307	0.6815	0.8230	0.6143	0.64
0.65	0.7399	0.9045	0.8181	0.2345	0.8834	0.9354	0.6911	0.8371	0.6194	0.65
0.66	0.7334	0.9018	0.8132	0.2396	0.8904	0.9399	0.7007	0.8512	0.6243	0.66
0.67	0.7268	0.8991	0.8084	0.2447	0.8972	0.9442	0.7103	0.8654	0.6290	0.67
0.68	0.7202	0.8964	0.8035	0.2498	0.9037	0.9483	0.7198	0.8796	0.6336	0.68
0.69	0.7136	0.8936	0.7986	0.2548	0.9100	0.9521	0.7293	0.8940	0.6380	0.69
0.70	0.7070	0.8909	0.7936	0.2598	0.9160	0.9558	0.7387	0.9083	0.6422	0.70
0.71	0.7004	0.8881	0.7887	0.2648	0.9219	0.9593	0.7481	0.9227	0.6463	0.71
0.72	0.6938	0.8853	0.7837	0.2697	0.9275	0.9626	0.7574	0.9372	0.6502	0.72
0.73	0.6872	0.8824	0.7787	0.2746	0.9328	0.9657	0.7667	0.9518	0.6540	0.73
0.74	0.6805	0.8796	0.7737	0.2795	0.9380	0.9687	0.7759	0.9664	0.6576	0.74
0.75	0.6739	0.8767	0.7686	0.2843	0.9429	0.9714	0.7851	0.9810	0.6611	0.75
0.76	0.6672	0.8738	0.7636	0.2890	0.9476	0.9741	0.7943	0.9957	0.6644	0.76
0.77	0.6606	0.8709	0.7585	0.2937	0.9521	0.9765	0.8034	1.011	0.6675	0.77
0.78	0.6539	0.8680	0.7534	0.2984	0.9564	0.9788	0.8125	1.025	0.6705	0.78
0.79	0.6473	0.8650	0.7483	0.3030	0.9605	0.9810	0.8215	1.040	0.6734	0.79
0.80	0.6407	0.8621	0.7432	0.3075	0.9643	0.9830	0.8305	1.055	0.6761	0.80