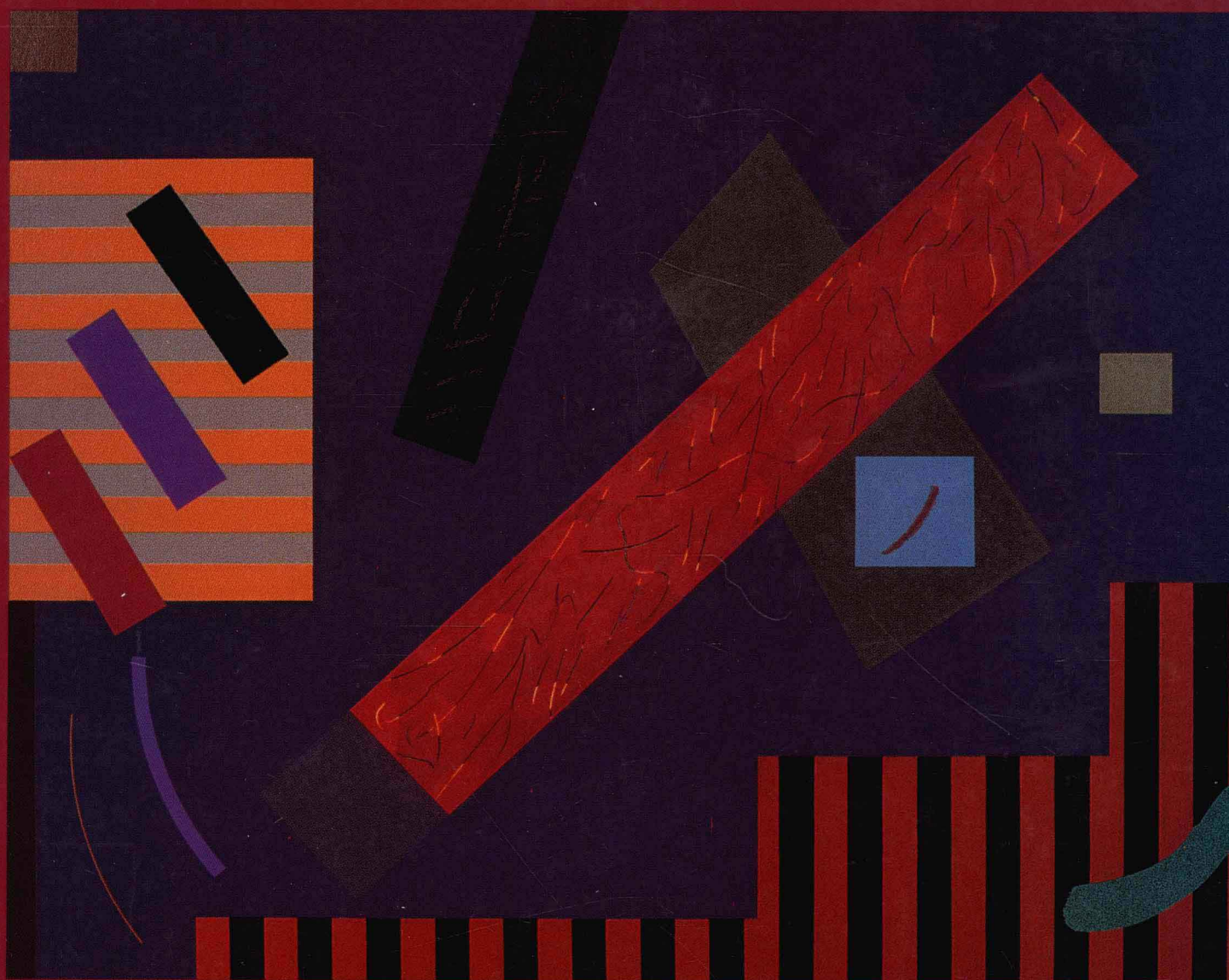


STUDENT WORKBOOK FOR

Modeling, Functions, and Graphs

THIRD
EDITION

ALGEBRA FOR COLLEGE STUDENTS



Yoshiwara ♦ Yoshiwara

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Note to Students

This workbook contains tables and grids for the activities and problems in your textbook. The grids are already labeled with appropriate scales for the graphs you will draw. We hope that providing these grids will eliminate some of the time-consuming work involved in drawing a graph, and allow you to concentrate on the mathematics.

The lessons in your textbook include Exercises printed on a blue background. There are copies of these Exercises in the workbook, with space for you to show your work and record your answers. You should try these Exercises as you read the text, to see if you understand the material.

You should try to keep your workbook up to date as your course progresses. You will also need a spiral or loose-leaf notebook for class notes and the rest of your homework problems. Your workbook and notebook will be useful study aids when you are preparing for exams.

How to Be Successful in Your Math Class

The key to success in a math class (as in most endeavors) is persistence. You cannot learn mathematics in one great rush the night before the exam; but you can master it in small chunks a little at a time. You should plan to study math for at least one hour every night. Don't give up until you have a good grasp of the lesson and can work the problems on your own. If you get behind in a math class it is very difficult to catch up.

1. Attend class every day.

Studies have shown that success in math classes is correlated strongly with attendance. If you must miss a class, find out beforehand what the class will cover. Read the lesson and complete the assignment anyway, just as if you had attended.

- a. Use class time wisely. This is your best opportunity to learn the material.
- b. Take notes. Learn to summarize what the instructor says, not just what he or she writes on the board.
- c. Don't be afraid to ask questions when you don't follow the lesson.

2. Read the text book.

Reading a math book is not like reading a novel. You will need to read the material more than once to understand and retain it.

- a. Read the new material *before* it will be covered in class.
- b. Read with a pencil in hand so that you can make notes to yourself, underline important points, or put question marks in the margins.
- c. Read the section again after it has been covered in class.

3. Look over your handouts and class notes.

The sooner you can review your notes after class, the better. People forget most of what they hear very quickly, and reviewing your notes will help you retain the new information.

- a. Look for points where your notes reinforce the material in the textbook.
- b. Try to fill in any steps or information you may have missed in class.
- c. Write a sentence or two summarizing the main points of the lesson.

4. Do the homework problems.

Most of your learning takes place when you work problems. If you do some of your work in a study group or tutoring center, you will have someone to consult as soon as you hit a snag.

- a. If you get stuck on a problem, refer to the textbook or your notes for help.
- b. Call a classmate on the phone and try to figure out together the problems you had trouble with.
- c. Mark any problems you can't get, but don't stop! Skip those problems for now, and continue on to the end of the assignment.

5. Get help right away.

Mathematics builds upon earlier material, so if you don't understand today's lesson you will have even more trouble tomorrow or the next day.

- a. Make a list of points you don't understand and problems you need help with.
- b. Ask your instructor or a tutor for help *today* -- don't put it off!
- c. Fill in your notes with the answers to your questions, and make sure you can work all the problems that gave you trouble.

6. Prepare for exams.

In addition to keeping up with daily work, you must prepare specifically for exams.

Always study 100% of the material the exam will cover. If you omit some topics, you won't be sure which problems you should work on during the exam!

- a. Begin studying for the exam a week ahead of time, so that you will have a chance to get help on any topics you are unsure about.
- b. Make a check-list or outline of the material the exam will cover, and review each topic until you have mastered it.
- c. Have a classmate or tutor make up a sample exam (or make one yourself), and practice working problems under exam conditions.

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Chapter 1 Linear Models

Investigation 1 Sales on Commission

Sales	Income
5000	
8000	
10,000	
12,000	
15,000	
18,000	
20,000	
25,000	
30,000	
35,000	

Table 1.1

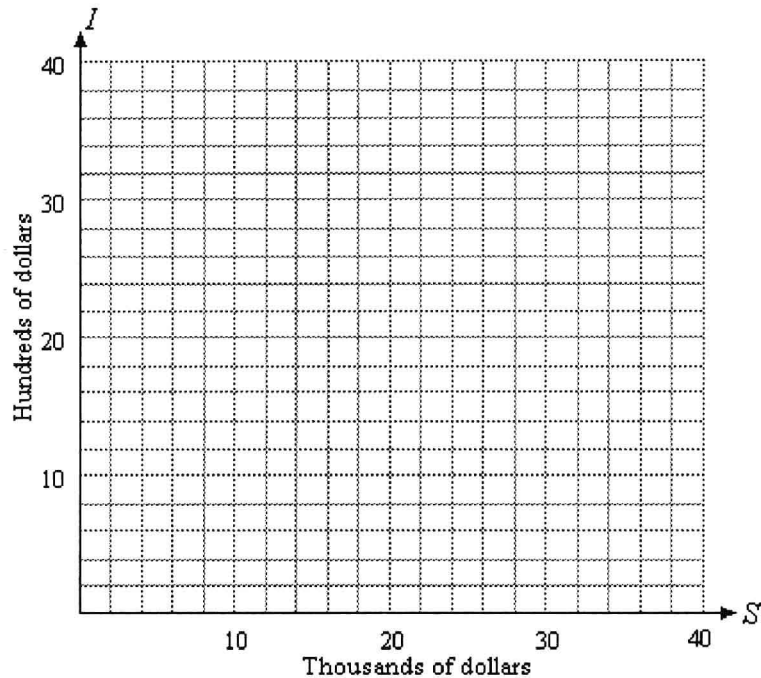


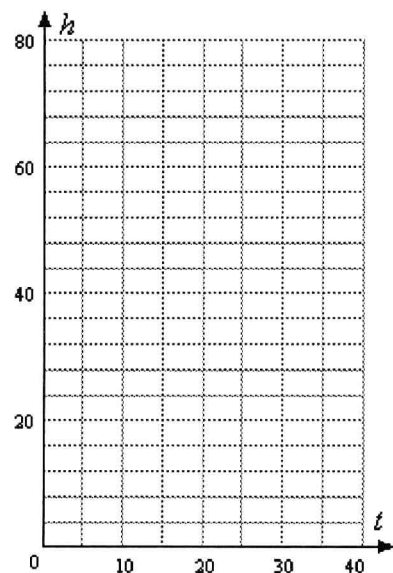
Figure 1.1

Section 1.1 Some Examples of Linear Models

Exercise 1 Frank plants a dozen corn seedlings, each 6 inches tall. With plenty of water and sunlight they will grow approximately 2 inches per day. Complete the table of values for the height, h , of the seedlings after t days.

t	0	5	10	15	20
h					

- Write an equation for the height h of the seedlings in terms of the number of days t since they were planted.
- Graph the equation on the grid.
- How tall is the corn after 3 weeks?
- How long will it be before the corn is 6 feet tall?

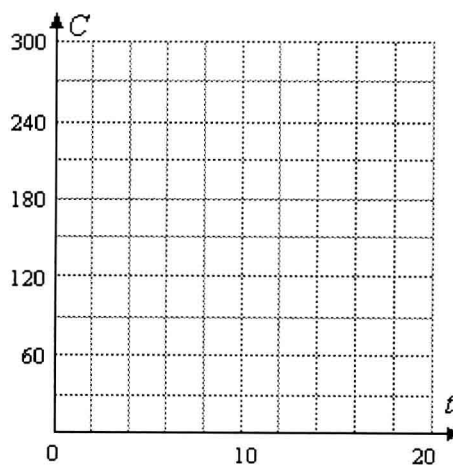


Exercise 2 Silver Lake has been polluted by industrial waste products. The concentration of toxic chemicals in the water is currently 285 parts per million (ppm). Local environmental officials would like to reduce the concentration by 15 ppm each year.

- a. Complete the table of values showing the concentration, C , of toxic chemicals t years from now. For each t -value, calculate the corresponding value for C . Write your answers as ordered pairs.

t	C		(t, C)
0		$C = 285 - 15(0)$	$(0, \quad)$
5		$C = 285 - 15(5)$	$(5, \quad)$
10		$C = 285 - 15(10)$	$(10, \quad)$
15		$C = 285 - 15(15)$	$(15, \quad)$

- b. Graph the ordered pairs on the grid, and connect them with a straight line. Extend the graph until it reaches the horizontal axis, but no farther. Points with negative C -coordinates have no meaning for the problem.
- c. Write an equation for the concentration, C , of toxic chemicals t years from now. The concentration is initially 285 ppm, and we *subtract* 15 ppm for each year that passes, or $15 \times t$.



Exercise 3 Find the intercepts of the graph of

$$2y = -18 - 3x.$$

To find the y -intercept, set $x = 0$ and solve for y :

To find the x -intercept, set $y = 0$ and solve for x :

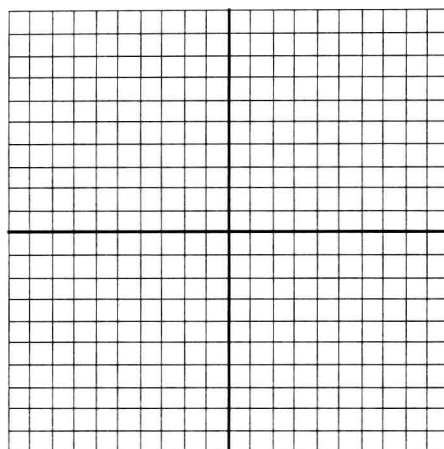
x	y
0	
	0

Exercise 4a. Find the intercepts of the graph of

$$60x - 13y = 390.$$

x	y
0	
	0

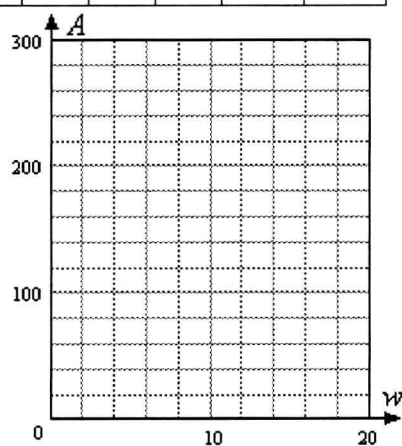
- b.** Use the intercepts to help you choose appropriate scales for the axes, and graph the equation.



Homework 1.1

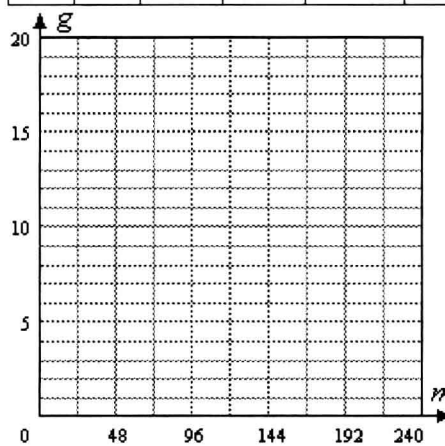
1.

w	0	4	8	12	16
A					



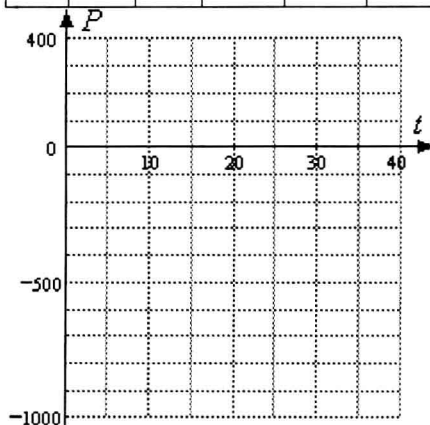
2.

m	0	48	96	144	192
g					



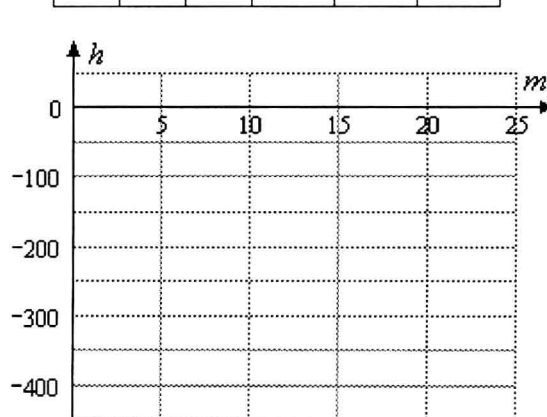
3.

t	0	5	10	15	20
P					

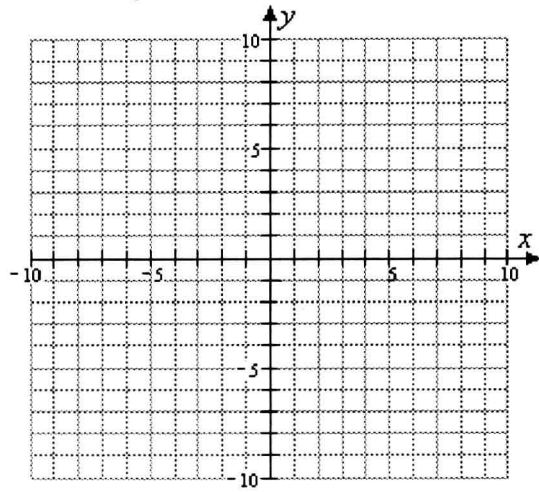


4.

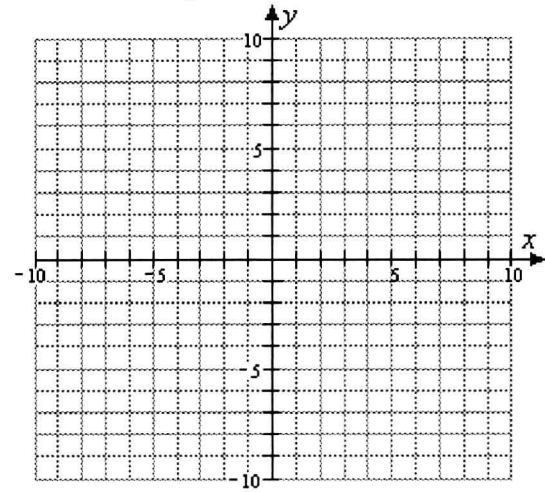
m	0	5	10	15	20
h					



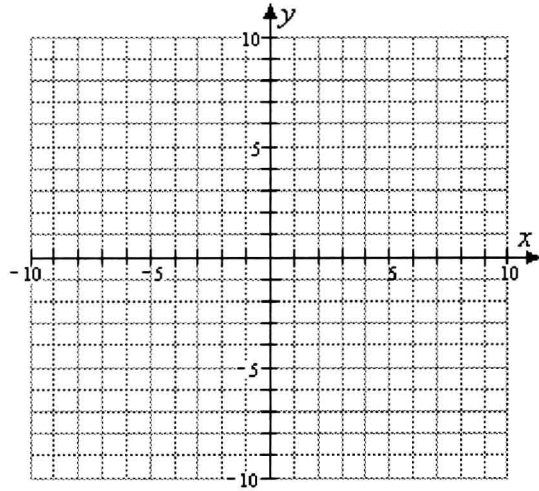
5. $x + 2y = 8$



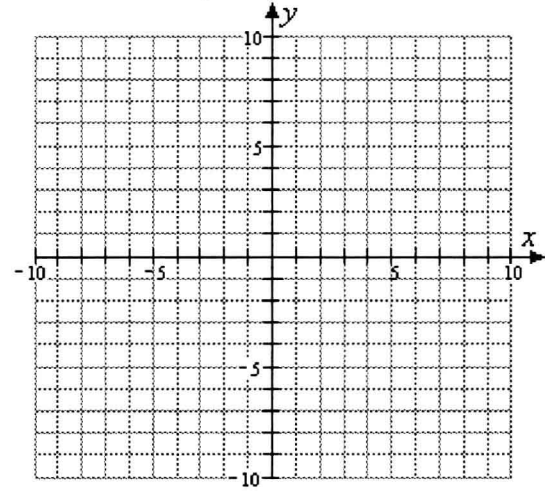
6. $2x - y = 6$



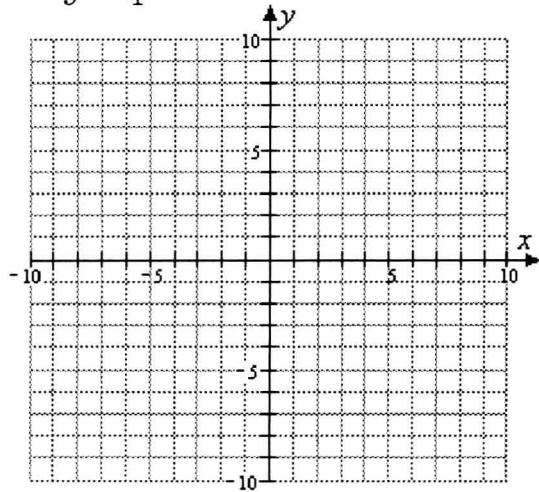
7. $3x - 4y = 12$



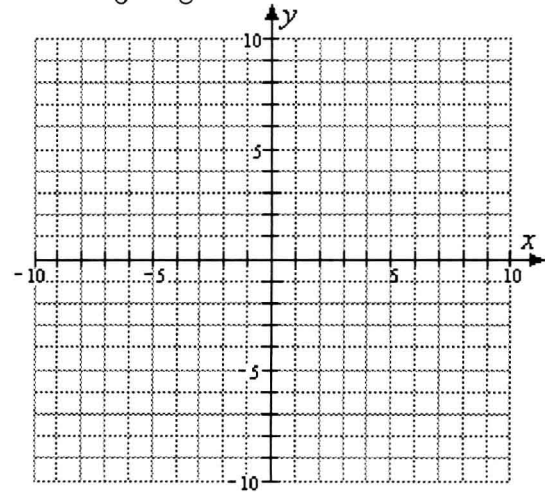
8. $2x + 6y = 6$



9. $\frac{x}{9} - \frac{y}{4} = 1$



10. $\frac{x}{5} + \frac{y}{8} = 1$



1.2 Using a Graphing Calculator

Exercise 1a. Solve the equation $7 - 2y = 4x$ for y in terms of x .

Subtract 7 from both sides :

Divide both sides by -2 :

Simplify :

b. Graph the equation in the standard window.

Press $\boxed{\text{Y=}}$ and enter the equation.

Then press $\boxed{\text{ZOOM}} \boxed{6}$.

Exercise 2a. Find the x - and y -intercepts of the graph of $2y - 1440 = 45x$.

x	y
0	
	0

b. Graph the equation on a graphing calculator. Choose a window that shows both of the intercepts.

Xmin =

Xmax =

Ymin =

Ymax =

Exercise 3a. Graph the equation

$$y = 32x - 42$$

in the window

$$\text{Xmin} = -4.7$$

$$\text{Xmax} = 4.7$$

$$\text{Xscl} = 1$$

$$\text{Ymin} = -250$$

$$\text{Ymax} = 50$$

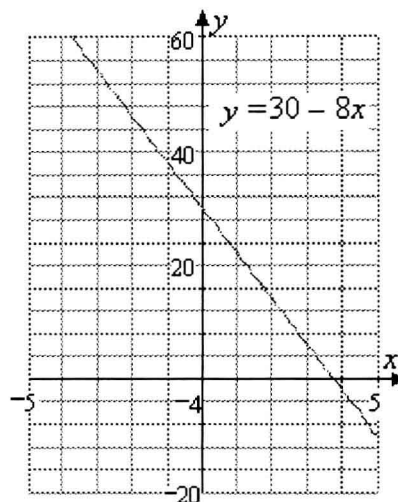
$$\text{Yscl} = 1$$

Use the $\boxed{\text{TRACE}}$ feature to find the point that has y -coordinate -122 .

b. Verify your answer algebraically by substituting your x -value into the equation.

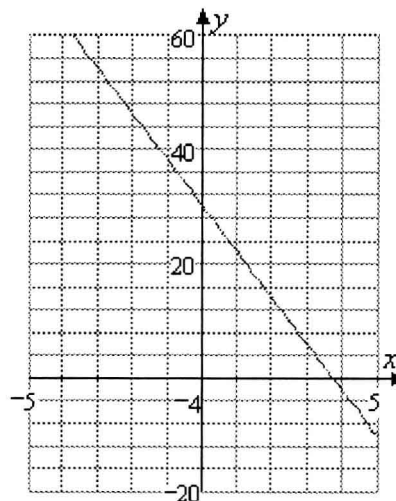
Exercise 4a. Use the graph of $y = 30 - 8x$ to solve the equation $30 - 8x = 50$.

b. Verify your solution algebraically.



Exercise 5a. Use the graph of $y = 30 - 8x$ to solve the inequality $30 - 8x < 14$.

b. Verify your solution algebraically.



Exercise 6a. Graph the equation $y = 1.3x + 2.4$. Set the **WINDOW** to

$$Xmin = -4.6 \quad Xmax = 4.8,$$

$$Ymin = -10 \quad Ymax = 10.$$

b. Use your graph to solve the inequality $1.3x + 2.4 < 8.51$.

Homework 1.2

17. Figure 1.17 shows a graph of $y = -2x + 6$.

a. Use the graph to find all values of x for which:

i) $y = 12$

ii) $y > 12$

iii) $y < 12$

b. Use the graph to solve:

i) $-2x + 6 = 12$

ii) $-2x + 6 > 12$

iii) $-2x + 6 < 12$

c. Explain why your answers to parts (a) and (b) are the same.

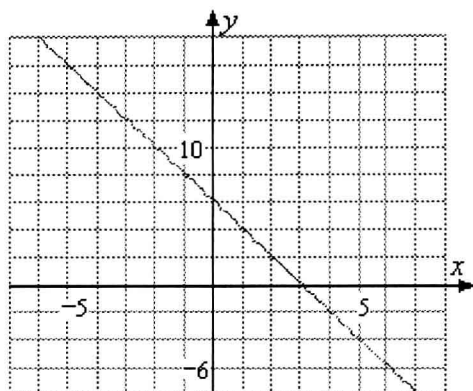


Figure 1.17

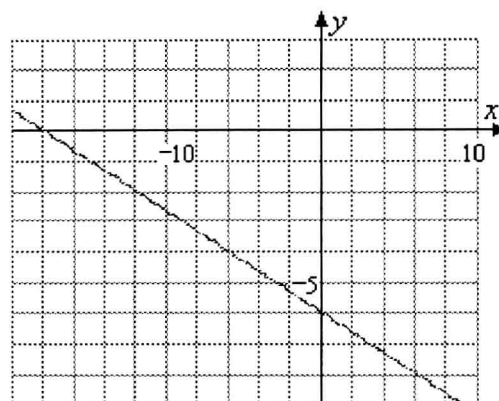


Figure 1.18

18. Figure 1.18 shows a graph of $y = \frac{-x}{3} - 6$.
- Use the graph to find all values of x for which:
 - $y = -4$
 - $y > -4$
 - $y < -4$
 - Use the graph to solve:
 - $\frac{-x}{3} - 6 = -4$
 - $\frac{-x}{3} - 6 > -4$
 - $\frac{-x}{3} - 6 < -4$
 - Explain why your answers to parts (a) and (b) are the same.
19. Figure 1.19 shows the graph of $y = 1.4x - 0.64$. Solve:
- $1.4x - 0.64 = 0.2$
 - $-1.2 = 1.4x - 0.64$
 - $1.4x - 0.64 > 0.2$
 - $-1.2 > 1.4x - 0.64$

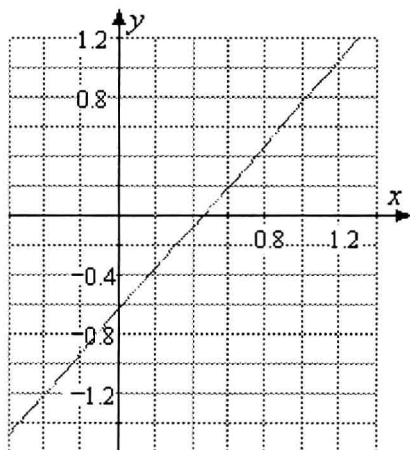


Figure 1.19

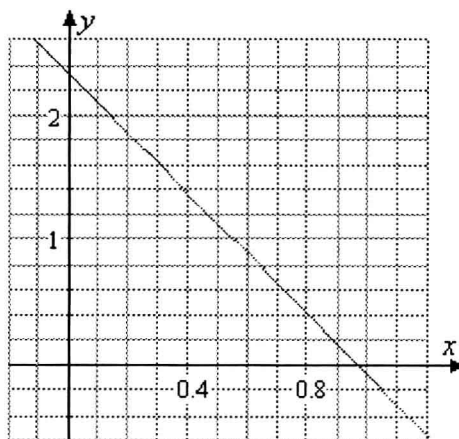


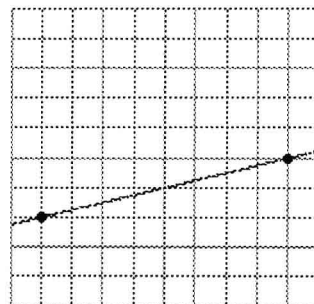
Figure 1.20

20. Figure 1.20 shows the graph of $y = -2.4x + 2.32$. Solve:
- $1.6 = -2.4x + 2.32$
 - $-2.4x + 2.32 = 0.4$
 - $-2.4x + 2.32 \geq 1.6$
 - $0.4 \geq -2.4x + 2.32$

1.3 Slope

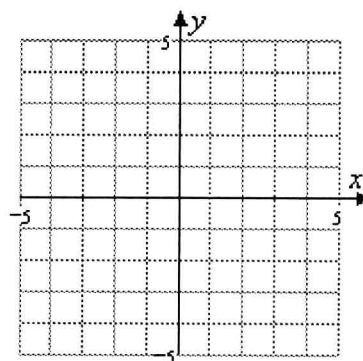
Exercise 1 Compute the slope of the line through the indicated points. On both axes, one square represents one unit.

$$\frac{\text{change in } y\text{-coordinate}}{\text{change in } x\text{-coordinate}} =$$



Exercise 2a. Graph the line $4x - 2y = 8$ by finding the x - and y -intercepts.

x	y
0	
	0



- b.** Compute the slope of the line using the x -intercept and y -intercept. Move from $(0, -4)$ to $(2, 0)$ along the line.

$$m = \frac{\Delta y}{\Delta x} =$$

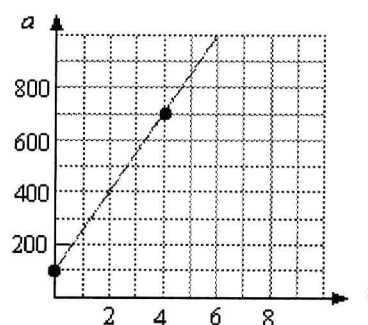
- c.** Compute the slope of the line using the points $(4, 4)$ and $(1, -2)$.

$$m = \frac{\Delta y}{\Delta x} =$$

Exercise 3 The graph shows the altitude a (in feet) of a skier t minutes after getting on a ski lift.

- a.** Choose two points and compute the slope (including units).

$$m = \frac{\Delta a}{\Delta t} =$$



- b.** Explain what the slope measures in the context of the problem.

