Using Macroeconomics:

A Problem-Solving Workbook
to Accompany

Kearl's
Principles of Macroeconomics

Prepared by Mark Rush

Using Macroeconomics:
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James R. Kearl's

Principles of Macroeconomics

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INTRODUCTION AND HOW TO USE THIS BOOK

Welcome to your economics class! The fact that you have purchased this workbook and are reading this introduction implies that you are serious about doing well in your course. This is a good sign, because your class probably will be one of the most interesting you will take in your college career, and may even lead you to major in one of the most fascinating subjects you will ever encounter, economics. Before you start, let me give you a few hints about how to use this workbook most effectively.

The workbook has been carefully designed to work with the textbook to help you learn the material. Professor James Kearl (the author of your text) and I believe that the *only* way to learn economics is to use it to solve problems. Therefore, each chapter in this workbook has many questions, ranging from essay questions, numeric questions, questions that use graphs, and a few "challenge questions" to really put you to the test. Most importantly, there are complete and thorough answers to all the questions. Of course, although the answers and reasons behind the answers to each question are given, you should always attempt to solve each problem by yourself *before* looking at the answer. The questions have been designed to help guarantee that you thoroughly understand the important points in each chapter and to give you valuable practice in seeing how economics can help you understand issues in the real world. Some of the questions cover fairly routine points; others give you the opportunity to stretch your wings and fly. *All* the questions are important, so take them seriously.

In addition to the questions, there is also a chapter summary for each chapter and, for many chapters, a section called "In the News." The chapter summary is a narrative review of the material in the text. These reviews are *not* substitutes for the material in the textbook. The textbook contains many supporting and enriching details omitted from these reviews. If you try to rely solely on these short summaries, you are doomed! Few students want to be doomed; so don't try to use this book as a substitute for reading the text. After you study the chapter in the text, the summaries in this workbook are designed to help refresh your memory. This should prove especially useful around test time. Finally, the "In the News" section consists of articles reprinted from *The Wall Street Journal* and the *New York Times*. These articles can be analyzed using the material you have learned in your textbook and instructor's lectures. Analyzing the articles and answering the questions asked about them enables you to see that the economic analysis you learn in your class is a powerful tool that enables you to sort sense from nonsense about important issues. Indeed, you might sometime want to read one of these articles before reading the relevant material in the textbook. Then, read it again after studying the textbook. You will be amazed at the increase in your ability to understand the subject of the article!

Though it is rare to acknowledge help in the preparation of a workbook, I must thank two people. First, George Lobell, editor at D.C. Heath, basically constructed this workbook. (Of course, George left me the task of writing it!) Second, Stephen Wasserstein, also at D.C. Heath, kept my nose to the grindstone. (The plastic surgeon's bill will soon be sent to Stephen.) Both George and Stephen helped make this workbook what it is; I gratefully thank both.

Finally, let me tell you that James Kearl, your instructor, and I all wish you good luck in your new class. You are in for an exciting, fascinating time because you will be learning the most modern theories in economics. Have fun!

TABLE OF CONTENTS

Part 1

Introduction

CHAPTER 1

# Scarcity, Choices, and Costs

Chapter Summary

We live in a world characterized by scarcity. This scarcity constrains our lives and our behavior. Because scarcity is so important in shaping our actions, economists have a formal definition of it: Something is **scarce** if people want more of it than exists. Indeed, **economics** can be defined as the study of how individuals and groups of individuals respond to and deal with scarcity.

The Problem of Allocation. Scarcity forces people to make choices. For instance, time is scarce. Because of this, if a person chooses to engage in more **leisure**—time spent at activities that do not increase the number of goods and services the individual can consume—the person must reduce his or her hours spent at **work**—activities that increase the number of goods and services that the person can consume. Taking more leisure means that less work can be performed. Other choices also are necessary. For instance, suppose you were Robinson Crusoe. Then when you decide to work you must choose what combination of goods and services to produce: how much food, water, clothing, shelter, and so on. Producing more of one item necessarily means that less of something else can be produced. Additionally, you need to decide how much to save. **Saving** occurs when people choose to consume less than they produce. Thus, with unchanged income, you cannot consume more *and* save more. Finally, you might decide to produce more capital by investing. **Capital** is anything that is produced and then used to help produce other goods or services; **investment** is the production of new capital. Producing more capital means you can produce fewer goods and services for current consumption.

The Problem of Allocation: Costs. Scarcity forces choices and choices always have costs. The **opportunity cost** of a particular choice is the value of the best alternative action that can no longer be taken.

Scarcity and opportunity cost are related. Returning to the Robinson Crusoe example, suppose you can gather coconuts or palm leaves when you work. There are many possible combinations of coconuts and leaves that can be gathered. A **production possibilities frontier (PPF)** shows all the maximum combinations of coconuts and leaves you can gather. Thus, the PPF shows the output mixes you can produce and those you cannot. This is illustrated in the figure below, where it is not possible to attain combinations beyond the PPF line. The PPF also shows that

Production possibilities frontier (PPF)
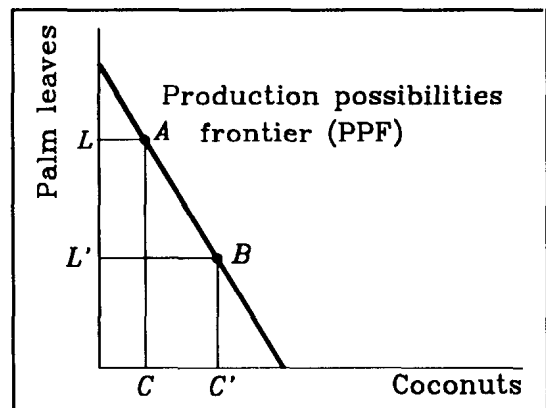
if you decide to produce (and consume) more coconuts, the opportunity cost is that fewer palm leaves can be produced (and consumed). In other words, at point A, C coconuts and L palm leaves are produced; moving to point B produces more coconuts (C') but fewer palm leaves (L').

The PPF in the figure above is for the case where you work 8 hours a day. If you choose to work more, the PPF shifts to the right, as shown below, indicating the new (and increased) mixtures of coconuts and
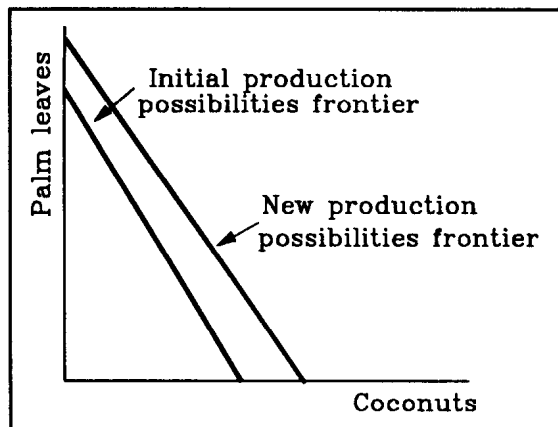
palm leaves you can produce. The PPF also shifts if the capital stock increases. Capital in the form of tools is **physical capital**; capital in the form of people with skills is **human capital**. Finally, an advance in technology also shifts the PPF out. **Technology** is the way that inputs are combined to produce output; technological advances refer to the situation where the same quantity of inputs can produce more output than before.

The Role of Logical Models. The production possibility frontier in the figures is an abstract, simplified way of looking at complex issues. It is an example of a **logical model**: An abstraction that shows the most important aspects of a complicated situation. Logical models are useful tools for they allow us to understand the essential nature of an issue and cast light on the real world.

The Problem of Coordination. In an economy with more than one person, scarcity forces the society to coordinate competing wants. Among others, questions such as "How will competing interests be coordinated?" and "How will scarce resources be distributed?" must be answered.

Economists assume that people generally pursue actions in their self-interest. A **self-interested** person makes choices on the basis of how the choice affects himself or herself, without concern for the impact on others. While self-interest is assumed to guide people's choices, these choices are influenced by the incentives people face. An **incentive** is anything that provides an inducement for a particular choice.

People's pursuit of self-interest makes coordination of choices important. Choices can be coordinated by someone in authority, by the power of custom, or by appeals to be a team player. More commonly in our society, however, competing interests are coordinated by competition itself. A kind of "spontaneous order" springs up from the interaction of self-interested people. In large part, the rest of the chapter is devoted to examining and studying this spontaneous order.

Exchange, Specialization, and the Invisible Hand. Suppose you are stranded on a desert island and every day you are given 200 manna (a type of breadfruit) and 20 quail. Obviously, the more manna or quail you have, the better off you are. Suppose you like manna, and compared to the original mixture would prefer a combination of 210 manna and 17 quail. Also on the island is Friday. He, too, receives 200 manna and 20 quail but would rather have 180 manna and 21 quail. You and Friday can engage in exchange: He gives you 10 manna and you give him 2 quail. Both of you are better off as a result. This exchange has an invisible hand result. The **invisible hand** is a concept first explained by Adam Smith that describes how the pursuit of self-interest can have beneficial results for others.

This example demonstrates four important results:

- Both parties to the exchange are better off; each has improved his or her welfare even though neither person consciously intended that the other one benefit.

- The gains from trade result because you and Friday value quail and manna differently. Differences among individuals make spontaneous coordination easier. While you and Friday both gain from the trade, the amount of the gain is not necessarily divided equally between the two of you.

- Unlike an athletic contest, exchange does not mean one person must win and the other lose. Instead, both parties win.

- Even though the amount of quail and manna does not increase, the exchange makes both people better off.

In reality, people must work to obtain commodities. Friday's abilities may differ from yours; he may be relatively better at gathering coconuts. Friday's PPF is illustrated below. Along Friday's PPF, gathering an additional coconut costs one-fourth of a

Friday's production possibilities frontier
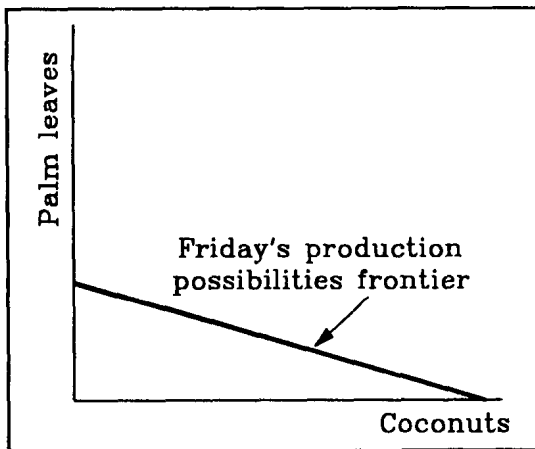
palm leaf. Along your PPF, gathering an extra coconut costs two palm leaves. The difference in relative costs causes the difference in the slopes of the PPFs.

Because of the different relative costs of gathering coconuts and palm leaves, mutually beneficial exchange is possible. If you produce 2 more palm leaves it costs you 1 coco-

nut. You can trade the 2 leaves to Friday. Meanwhile, Friday can reduce his production of palm leaves by 2, thereby gathering 8 additional coconuts. In exchange for the palm leaves, he may trade you 3 of these coconuts. Both of you are better off because you each have more coconuts than before and no fewer palm leaves. Exchange such as this leads you and Friday to specialize in producing only one product and trading with the other person for the other product. This specialization and exchange allows *both* of you to consume more coconuts and more palm leaves than before.

In the example, you specialize in producing palm leaves and Friday in coconuts. Specialization is determined by the **relative production cost**, that is, by the amount of one commodity that must be given up to produce a unit of another commodity. A person has a **comparative advantage** in producing a product when his or her relative production cost is lower than that of his or her trading partners. This can be contrasted with an **absolute advantage** in a product, which a person possesses when he or she can produce more of a good than someone with whom he or she trades. The key point is that specialization depends on relative production costs, that is, comparative advantage, not on overall productivity, or absolute advantage.

With specialization and exchange, both you and Friday are better off. The division of the gains from trade, however, depends on the exchange ratio, that is, the cost of coconuts in terms of palm leaves. If the exchange ratio changes, one person is better off and the other worse off, but the essential point is that *both* remain better off compared to the pre-trade situation.

Individual Outcomes and Social Aggregation. What is true for an individual may not remain true when extended to the economy at large. For instance, an individual may be able to get a bigger slice of a pie but it is impossible for everybody to get a bigger slice. The **fallacy of composition** is the (false) assumption that what is true for an

individual must be true for a group of indi-
viduals. Because of this difference, sometimes
an individual's pursuit of his or her self-
interest does not lead to a satisfactory result
for society.

People's behavior is shaped by the incen-
tives they face, and, in turn, incentives are
determined by the social structure. The **social
structure** is society's collection of formal,
informal, and traditional rules. Public policies
that attempt to change the social structure
while letting individuals behave as they
choose are quite different from policies that
try to change people's behavior while leaving
the social structure the same.

Economics is generally divided into two
topics: microeconomics and macroeconomics.
Microeconomics studies smaller units within
the economy, such as the decisions of indi-
viduals and firms who buy and sell in particu-
lar markets. **Macroeconomics** examines the
behavior of the economy as a whole.

Economic analysis can be either norma-
tive or positive in nature. **Normative analysis**
tells what should be done; **positive analysis**
describes the world and how it behaves.
Often positive analysis is used to support
normative proposals, but the two modes of
analysis are quite different.

Appendix. When there is a relationship
such that for every value of a **variable**
(something that can change), say x, there is a
single value of another variable, say y, y is
said to be a **function** of x. This is written as
$y = f(x)$. Often it is useful to graph a rela-
tionship. A graph has four quadrants; in eco-
nomics usually only the quadrant where both
y and x are positive is used. (There are ex-
ceptions; sometimes the quadrant where y is
negative is also included.) A typical graph is
shown at the top of the next column. The
variable x is measured along the **horizontal**
or *x*-axis; the y variable is measured along
the **vertical** or *y*-axis. The point where the
two axes meet is called the **origin**. The scale
along the axes need not be the same. The
graph shows the function $y = 2x$. Here y is

$$y = 2x$$
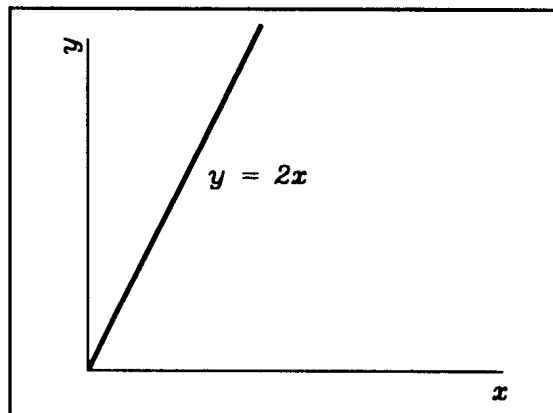
positively related to x; that is, as x gets big-
ger, so, too, does y. A negative relationship
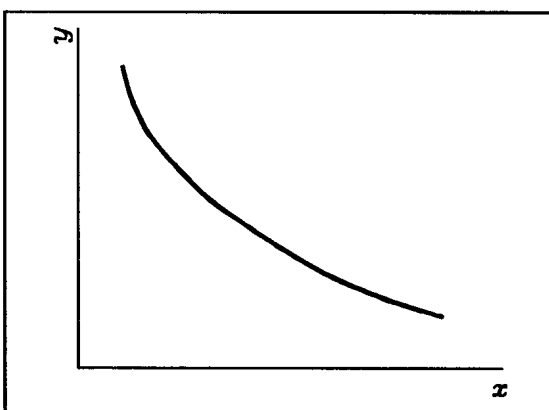
is graphed in the figure above. Here as x gets
larger, y gets smaller.

Some graphs show how the value of a
variable has changed over time. These graphs
measure time along the horizontal axis and
the variable along the vertical axis. This sort
of graph is called a **time series**.

The **slope** of a relationship measures how
much the y variable changes when the x
variable changes. Using "Δ" to mean
"change in," the slope is defined as

$$\text{slope} = (\Delta y)/(\Delta x),$$

or less formally, as "the rise over the run."
A straight line's slope is constant at every
point. The slope of a curved line at a point
equals the slope of the line tangent to the
curve at that point. Relationships that slope
up to the Northeast have positive slopes; rela-
tionships that slope down to the Southeast

have negative slopes.

The **intercept** of a graph is the point at which it crosses one of the axes. On a graph, the area of a rectangle equals the width of the rectangle multiplied by the height. Thus an area equals the amount of the variable measured on the vertical axis times the amount of the variable measured on the horizontal axis. The maximum or minimum of some graphs
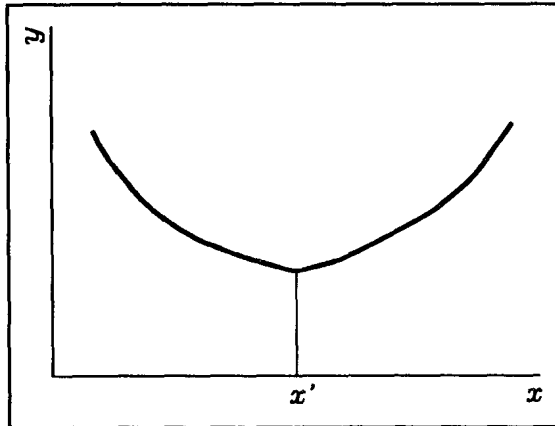
can be important. As illustrated above, the slope of the graph changes signs from one side of a minimum (or maximum) to the other. On the left side of the minimum the slope is negative; on the right side it is positive.

Graphing with Three Variables. If a relationship is between three variables, say x, y, and z, it can still be graphed on a two dimension diagram. In this case, the graph of the relationship between, say, x and y is drawn for a particular value of z; if z changes, the x, y relationship shifts.

To be useful, graphs must use appropriate measurement units, have scales that do not mislead, and use variables that are relevant for the issue being examined.

Graphing More than One Function. Often two or more functions are drawn on one figure. This requires that the scales along the axis make sense for each function. For instance, if one function relates the price and quantity of a product and another also relates price and quantity, the two functions can be drawn on the same figure. The point on a figure where the graphs of two functions intersect is often important because at that point the values of the variables are the same for each function.

Quantities can be measured as either stocks or flows. A **stock** is a quantity that can be measured at a point in time; for instance, the amount of money you have saved in a savings account. A **flow** is a quantity that needs to be measured over time; for instance, your income over this year.

Essay Questions

1. "Scarcity is something that exists today only in poor nations. It is no longer a problem in modern advanced societies like our own." Comment on this claim.

2. What is the opportunity cost of answering this question?

3. How do costs create incentives?

4. By assuming that people follow their own self-interest, do economists rule out the pursuit of other, more altruistic motivations for behavior?

5. The example in the text dealing with specialization assumed that Friday could produce an additional coconut at the cost of one-fourth of a palm leaf while you could produce an additional coconut at the cost of two palm leaves. For Friday, what is the relative production cost of a coconut? For you, what is the relative production cost? For Friday, what is the

opportunity cost in terms of palm leaves of producing an additional coconut? What is your opportunity cost of another coconut? What is the relationship between relative production costs and opportunity costs? Rephrase the definition of comparative advantage using the term "opportunity cost."

6. If you and Friday each devoted your entire workdays to gathering palm leaves, suppose you could gather more than Friday. Further, if you both spent all day gathering coconuts, you could also gather more coconuts than Friday. Does this mean that trade between you and Friday is unable to make you better off?

7. The relative production cost to you of producing a coconut is 10 palm leaves; to Friday it is 5 palm leaves. Who has the lower relative production cost for coconuts? Who will specialize in the production of coconuts? Suppose the maximum number of coconuts you can produce is 50; what is the maximum number Friday can produce?

8. Is studying the factors that determine the level of employment within a specific industry a microeconomic or macroeconomic topic? What about studying the things that affect the national level of employment; is this microeconomic or macroeconomic in nature?

9. a. "The government ought to increase the tax it imposes on oil companies because their profits are too large." Is this statement normative or positive in nature?
    b. "If the government increases the tax it levies on oil companies, their profits will decrease." Is this statement normative or positive?
    c. "Batman was elected President in 1992." Is this a normative or positive statement?

Numeric Questions

1. Everyone knows that attending college is expensive. But this cost frequently is calculated incorrectly and, as a result, is understated. The following paragraph describes the financial situation of a student attending a university. In terms of dollars, what is the opportunity cost of attending college for the year; in other words, what is the opportunity cost incurred because the student is going to college?

    Sue Student, an aspiring scholar at a major college, pays $15,000 in tuition to her school. She lives on campus and pays $6,000 for food and rent to her college. Sue also spends $2,000 on other activities, such as pizza, parties, and parking her car. She buys $500 of textbooks per year and makes car payments of $3,600 in a year. Sue is not working this year while in college; but if she did not go to college, she had a job lined up that would have paid her $18,000. If she worked this year, she would have spent $6,000 on food and rent, as well as an additional $2,000 on other expenses. Sue would, of course, have made her car payments of $3,600 even if she did not go to college.

2. You and Friday are on a desert island, each receiving 20 quail and 200 manna. You like manna a lot better than quail and are willing to give up 1 quail in exchange for 2 manna. Friday likes quail more than manna and is willing to give up 20 manna for 1 quail. Is there a voluntary exchange in which you and Friday can exchange 1 quail for some manna? What are the limits to the number of manna exchanged; that is, for 1 quail, what are the minimum

and maximum number of manna that might be exchanged? Comment on how the number of manna exchanged determines the division of the gains from trade.

3. Continuing with the situation outlined in Question 2, the day before you are rescued, your tastes change. You now like quail more than manna and will give up 20 mannas for 1 quail. Is there an exchange that makes both you and Friday better off?

4. a. If you produce 1 additional coconut, you lose 2 palm leaves. If Friday produces 1 additional coconut, he loses 4 palm leaves. What is your relative production cost of a coconut? What is Friday's relative production cost of a coconut?
   b. What is your relative production cost of a palm leaf? What is Friday's relative production cost of a palm leaf?
   c. Whose relative production cost for a coconut is lowest? For a palm leaf? Who has a comparative advantage in producing coconuts? Palm leaves?

Graphing Questions

1. In the figure to the right, show what happens if the capital stock increases. After the increase in the capital stock, is it possible to consume more of *both* products? Be sure to illustrate how this is or is not possible.
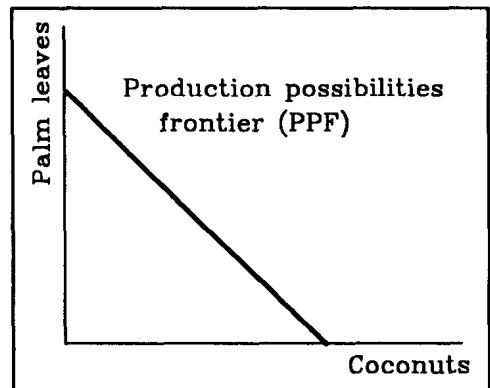

2. Use the figure to the right to illustrate what happens to the production possibilities frontier if a coconut blight hits the economy. In particular, suppose that a large proportion of coconut trees drop dead so that coconuts are no longer as readily available.
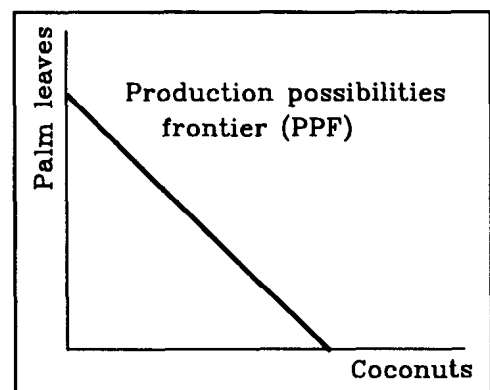
3. In the diagram to the right, use a vertical line to indicate the number of palm leaves lost if, from point A, coconut production is increased by 1. Call this amount ΔL. What is the opportunity cost of obtaining one more coconut? What is the slope of the PPF?
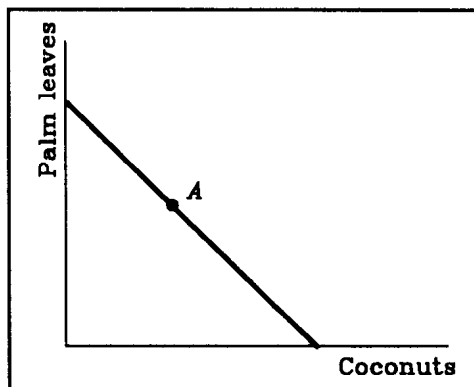
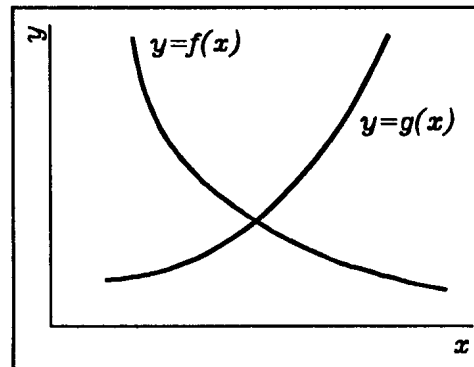4. *(Appendix)* The relationship to the right reaches a maximum at x'. What is the slope of the curve left of x'? The slope at x'? The slope to the right of x'?
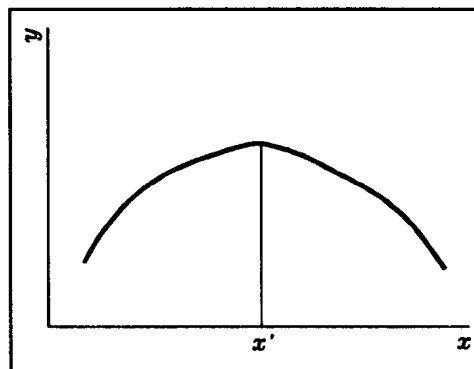
5. *(Appendix)* In the figure to the right, crosshatch the area that equals the amount xy.
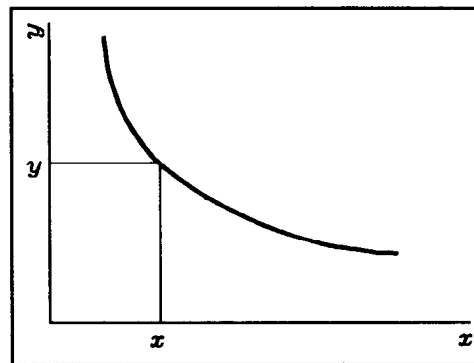
6. *(Appendix)* Two functions, $y = f(x)$ and $y = g(x)$ are graphed in the figure to the right. At what value of x does each function give the same value for y?

Challenge Questions

1. The production possibilities frontier illustrated and discussed in the text examined the situation for one individual that could produce only two things. Of what possible use is this example for our advanced economy, with millions of workers and billions of products?

2. Why must voluntary trades make both parties to the transaction better off?

3. a. You and Friday are stranded on a desert island. Every day each of you receives 20 quail and 100 manna. You think that 1 quail is the equivalent of 10 manna; in other words, if you give up a quail, you want at least 10 manna, or if you get a quail you are willing to give up no more than 10 manna. Friday, though, likes quail more than manna and is willing to give up 20 manna for 1 quail or vice versa. Can an exchange of 1 quail make you and Friday better off? Who gets the quail and who gets the manna? What are the limits on the number of manna exchanged?
    b. More time is spent on the island and your tastes change. You are now willing to exchange 1 quail for 30 manna or vice versa. Is there an exchange that improves the well being of both you and Friday? Who gets the quail and who the manna? What are the maximum and minimum number of manna that might be exchanged?

ANSWERS

Essay Questions

1. This claim is simply wrong: Scarcity exists in all nations and likely will exist for all time. Whenever people want more of something than is available, that item is considered scarce. Take lobster for example. Everybody in total might want 2 million lobsters a day. Since there are nowhere near this many lobsters produced, not everyone can have a lobster. Lobsters are therefore scarce. But this same line of reasoning can be made about virtually anything. Thus, it is apparent that scarcity surrounds us.

2. The opportunity cost of any action is the next best alternative foregone. So, ask yourself: If you were not answering this question, what would you be doing? Studying history? Reading a chapter in your physics text? Watching television? Sleeping? Partying? Whatever it is you would be doing, that is the opportunity cost of answering this question.

3. Costs play a large role in shaping people's incentives. Recall that an incentive is something that provides an inducement to make a particular choice. The cost of an action obviously provides a major inducement. For instance, if the cost of an action increases, this provides people an incentive *not* to take the action. Say, for example, the cost of a slice of pizza rises from $2 to $20 and nothing else changes. Thus, the cost of eating pizza for lunch increases. This provides people with a strong incentive to choose to eat something else, say a taco.

4. By focusing on self-interest only, economists do not entirely rule out other factors as influencing people's behavior. It is hard, however, to think of many deeds where self-interest does not play a role. For instance, while it is clear that contributing money to

charities is motivated primarily by generosity, nonetheless self-interest does play a role. This is revealed by the fact that contributions in the United States fell when the tax deduction allowed for donations was reduced. Economists recognize the pervasive nature of self-interest and focus on it. However, by emphasizing self-interest, economists do not say that this is the way the world should be but rather that this is the way the world is.

5. The relative production cost for Friday to produce an additional coconut is one-fourth of a palm leaf. The relative production cost for you to produce a coconut is two palm leaves. In terms of opportunity cost, the opportunity cost to Friday of an extra coconut is one-fourth of a palm leaf; to you the opportunity cost is two palm leaves. The point is, of course, that the relative production costs are the same as the opportunity costs. Thus, an individual has a comparative advantage in the production of a good if his or her opportunity costs of producing the good are lower than the opportunity costs for someone with whom the individual might trade.

6. No, trade is still likely to increase your well being. Although you have an *absolute* advantage over Friday in both products, trade is determined by *comparative* advantage. Thus, if you specialize in what you do relatively best and Friday specializes in what he does relatively best, and then trade with each other, both of you can enjoy more coconuts and palm leaves.

7. Clearly Friday's relative production cost of a coconut (5 palm leaves) is less than your relative production cost (10 palm leaves). Friday will specialize in the production of coconuts because his relative production cost is lowest. There is no way of determining the maximum number of coconuts Friday can produce. In other words, it is impossible to tell who has the absolute advantage in coconut production, you or Friday. But, this lack of knowledge does not affect the fact that Friday specializes in the production of coconuts because specialization depends on comparative advantage, not absolute advantage!

8. Examining what changes the amount of employment within a particular industry is a microeconomic topic because this looks at only one unit (one industry) within the economy. Studying what affects the nation's overall level of employment is, however, a macroeconomic subject because it addresses the economy as a whole.

9. a. This statement is normative in nature. It tells what should be done. It is important to notice that reasonable people can disagree forever without reaching agreement about a normative issue because normative opinions depend on value judgements. For instance, if you own a large oil company, your opinion would probably disagree sharply with this statement.
    b. This is a positive statement because it describes (makes a prediction about) what will happen if taxes on oil companies are increased. Note that unlike normative statements, at least in theory positive statements can be tested to determine their accuracy. In this case, if taxes are increased on oil companies it is possible to ascertain if this positive statement is correct.
    c. This is a positive statement, though clearly false. It is a positive statement by virtue of the fact that it (tries to) describe the world.