

## Objectives for Chapter 6      Supply and Equilibrium

At the end of chapter 6, you will be able to:

1. Define the *Law of Supply*
2. Differentiate Between the Causes of a **Movement Along** the Supply Curve and a **Shift** in Supply
3. Name and Explain the **Four Factors** that will cause the Supply of a Given Product to Shift to the Left (or to the Right).
4. Explain "**equilibrium**"? Explain how the equilibrium price and quantity are determined?
5. If the price is above equilibrium, explain what will result? If the price is below equilibrium, explain what will result?
6. Explain what will happen to the price and the quantity in each of the following cases (as well as why this will happen):
  - a. there is an increase in demand or a decrease in demand
  - b. there is an increase in supply or a decrease in supply
7. Explain what will happen to the price and the quantity in each of the following cases, as well as why it will happen:
  - a. both demand and supply increase    c. demand increases and supply decreases
  - b. both demand and supply decrease    d. demand decreases and supply increases

## Chapter 6                      Supply And Equilibrium (latest revision August 2004)

### 1. Supply

In Chapter 5, we focused exclusively on the behaviors of buyers. But buyers are only half of the market. We must also consider the behaviors of **sellers**. Discussing sellers is somewhat easier because we can safely **assume that sellers have only one motivation: to maximize their profits**. Sellers will be motivated to do more of anything that increases profits and less of anything that decreases profits. *Their total profits are calculated as the difference between their total revenues and their total costs.*

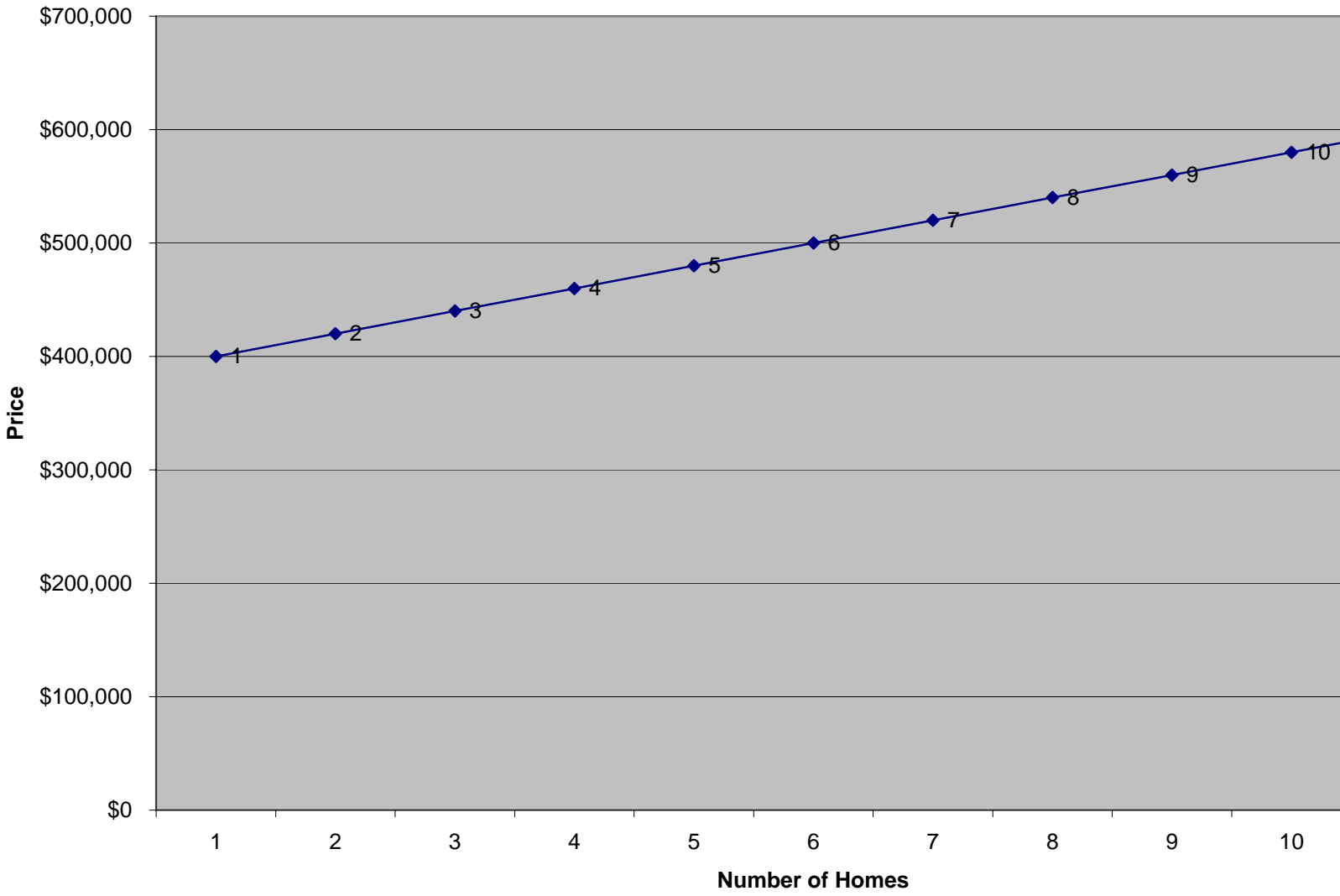
Let us begin with the **total revenues**, the money taken in from selling the product. Total revenues are calculated as the **price of the product times the quantity sold**. So, if we sell 100 units of the product at \$10 each, our total revenues equal \$1,000. If we sell 100 units at \$20, our total revenues equal \$2,000. Since we gain more revenues if the price is \$20 than if it is \$10, we would likely want to sell more units of the product if the price is \$20. *So we can conclude that as the price of the product rises (falls), the quantity supplied will rise (fall). We call this statement the law of supply.* (Go back and compare this statement with the law of demand.) To illustrate the law of supply, you would expect that more and more homes would be built after 1995 when the prices of homes began rising greatly. This is indeed what has occurred. You would expect electric power producers to produce more electricity after the prices doubled in the summer of 2000. And you would expect that more and more people would want to become engineers and scientists when the prices paid for these people (called the wages) rose. Again, indeed, this is what has occurred. (Does it make any sense that when the ticket prices charged for baseball and football games rose, Major League Baseball changed from 154 games to 162 games per year and the National Football League changed from 12 games to 16 games per year?)

We can illustrate the law of supply with a **supply schedule** for homes.

	Price of Homes	Quantity Supplied
1	\$400,000	2000
2	\$420,000	3000
3	\$440,000	4000
4	\$460,000	5000
5	\$480,000	6000
6	\$500,000	7000
7	\$520,000	8000
8	\$540,000	9000
9	\$560,000	10000
10	\$580,000	11000
11	\$600,000	12000
12	\$620,000	13000
13	\$640,000	14000

The schedule shows that, as the price charged for homes rises, sellers wish to sell more homes. We can also plot this in the graph below. This graph depicts the law of supply as an

# Supply of Homes



**upward-sloping line.** Notice that the line does not begin at the origin. There is some price --- above zero --- at which no seller will produce at all. As with the demand graph, we *move along* the line if the price of the product changes. (So we move along the line from point 12 to point 13 if the price rises from \$620,000 to \$640,000 per home. This tells us the quantity supplied, which rises from 12,000 homes to 13,000 homes.) We *shift* the line if anything else changes. Let us now consider the factors that cause shifts in supply, called the **determinants of supply**. There are **four** determinants of supply.

(1) The goal of a company, as stated above, is to maximize profits, calculated as the difference between the total revenues and the total costs of production. So, one of the determinants of supply must be the total **costs of production**. *As costs of production rise, profits fall, and therefore the quantity supplied should fall (shift to the left). Conversely, as costs of production fall, the profits rise, and the quantity supplied should rise (shift to the right).* Costs include the costs of natural resources such as wood used in building a home, the costs of labor (wages and benefits), interest rates, taxes, and the costs of the capital goods. We will consider them many times throughout the course.

(2) When we considered demand, one of the determinants was population (the number of buyers). The same is true for supply. One of the determinants of supply is the **number of sellers of the product**. *When the number of sellers increases, the supply should increase (shift to the right). When the number of sellers falls, the supply should decrease (shift to the left).* In this course, we will see that a major reason for the increase in the number of sellers of many products has been the opening of international trade – a topic that will be discussed several times.

(3) When we considered demand, one of the determinants was the price of a substitute good. Again, the same is true for supply. In this case, the substitute is **a substitute for the seller --- another good also produced by the same seller**. This may or may not be a substitute for the buyer. For example, wheat and corn can be grown on the same land; they are substitutes for the seller. So are avocados and oranges or Coca Cola and Diet Coke (because they are produced by the same company). *If the price of the other good rises, the supply of the good in question will fall (shift to the left).* For example, if the good in question is wheat and the price of corn rises, sellers will produce less wheat (and more corn). If the price of regular Coca Cola rises, the supplier will produce less Diet Coke (and more regular Coca Cola). On the other hand, *if the price of the other good falls, the supply of the good in question will rise (shift to the right).* Remember that goods are substitutes for the seller if they are produced by the same company.

(4) Finally, when we considered demand, one of the determinants was **expectations**. This is true for supply as sellers also have expectations that affect their behavior. *If sellers expect the price to rise, they will want to sell less today (shift to the left)* and wait for the price to rise later. Home sellers will hold their homes off the market if they believe the prices will rise soon. In 1973, oil tankers remained offshore while angry motorists waited in long lines for gasoline. The reason was that the price of gasoline was 36 cents per gallon. The government was allowing the price to rise only 2 cents per week; the oil companies estimated that it would rise to about 65 cents. So they reduced supply and waited until the price would reach the predicted 65 cents. Conversely, *if sellers expect the price to fall, they want to sell more now (shift to the right).* At the beginning of 1995, holders of Mexican pesos believed that the price would fall. They got rid

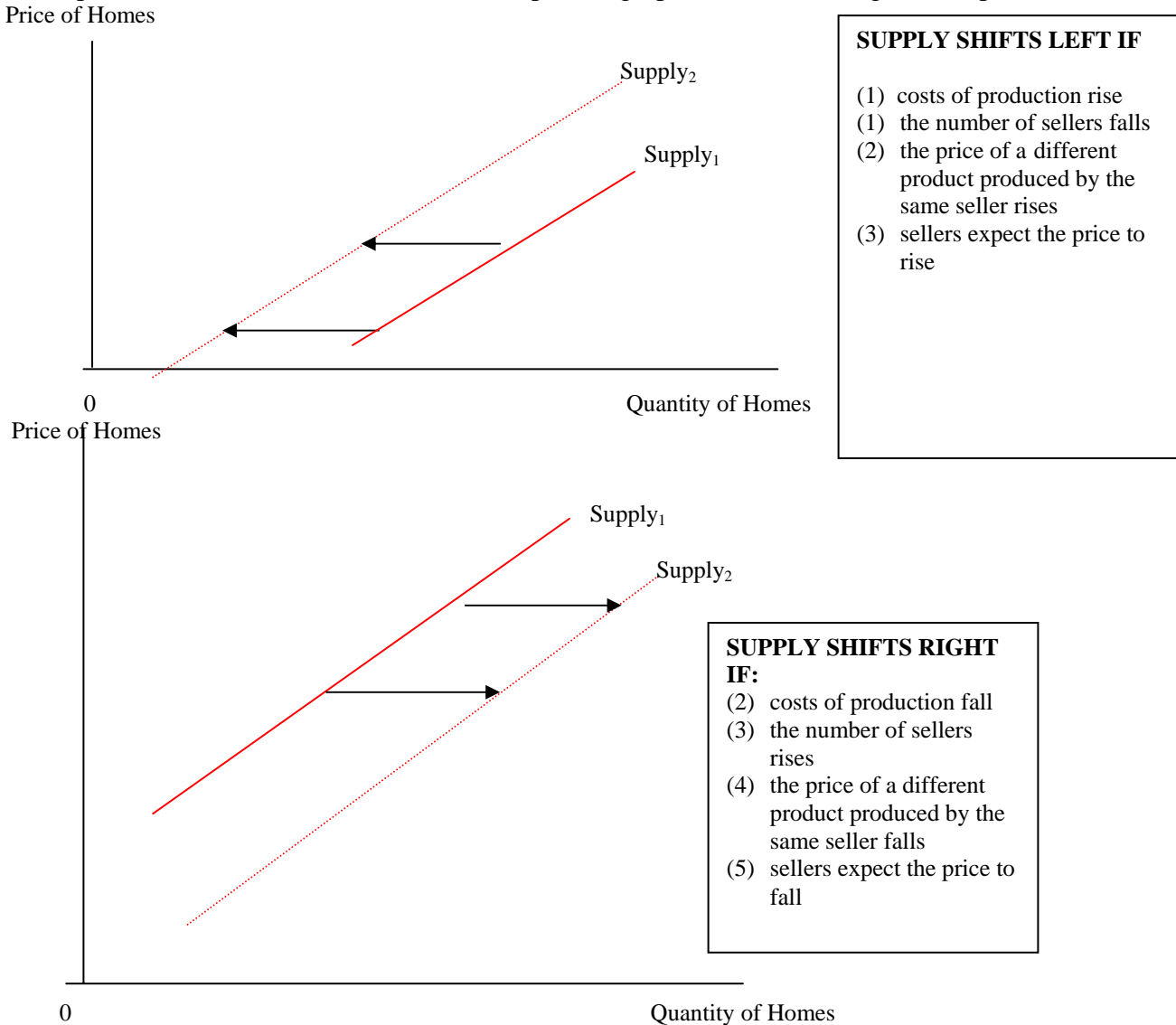
of them (sold them in the foreign exchange market) as fast as they could. The same is true for holder of stocks (ownership shares in companies) in the period after 2001.

***In summary, supply will shift to the left (right) if:***

- (1) costs of production rise (fall)***
- (2) the number of sellers falls (rises)***
- (3) the price of another good produced by the same seller rises (falls)***
- (4) sellers expect the price of the product to rise (fall) in the near future.***

## Graphing Supply

The graphs of a shift to the left and of a shift to the right are shown below. The possible reasons for the shifts are also shown. ***A shift to the left (right) means that sellers want to produce and sell fewer (more) homes than they did before at any price.*** (The shift is to the left and represents a decrease. It is NOT a shift up. The graph is read left to right, not up and down.)



### Test Your Understanding

Consider an orange grove. In each of the following cases, state whether there is a movement along the supply curve of oranges, a shift in the supply curve of to the right, or a shift in the supply curve to the left:

1. the wages paid to hired workers rises \_\_\_\_\_
2. the number of orange growers rises \_\_\_\_\_
3. the price paid by consumers for avocados rises \_\_\_\_\_
4. the price paid by consumers for oranges rises \_\_\_\_\_
5. orange growers expect the price of oranges to rise greatly soon \_\_\_\_\_

## 2. Equilibrium

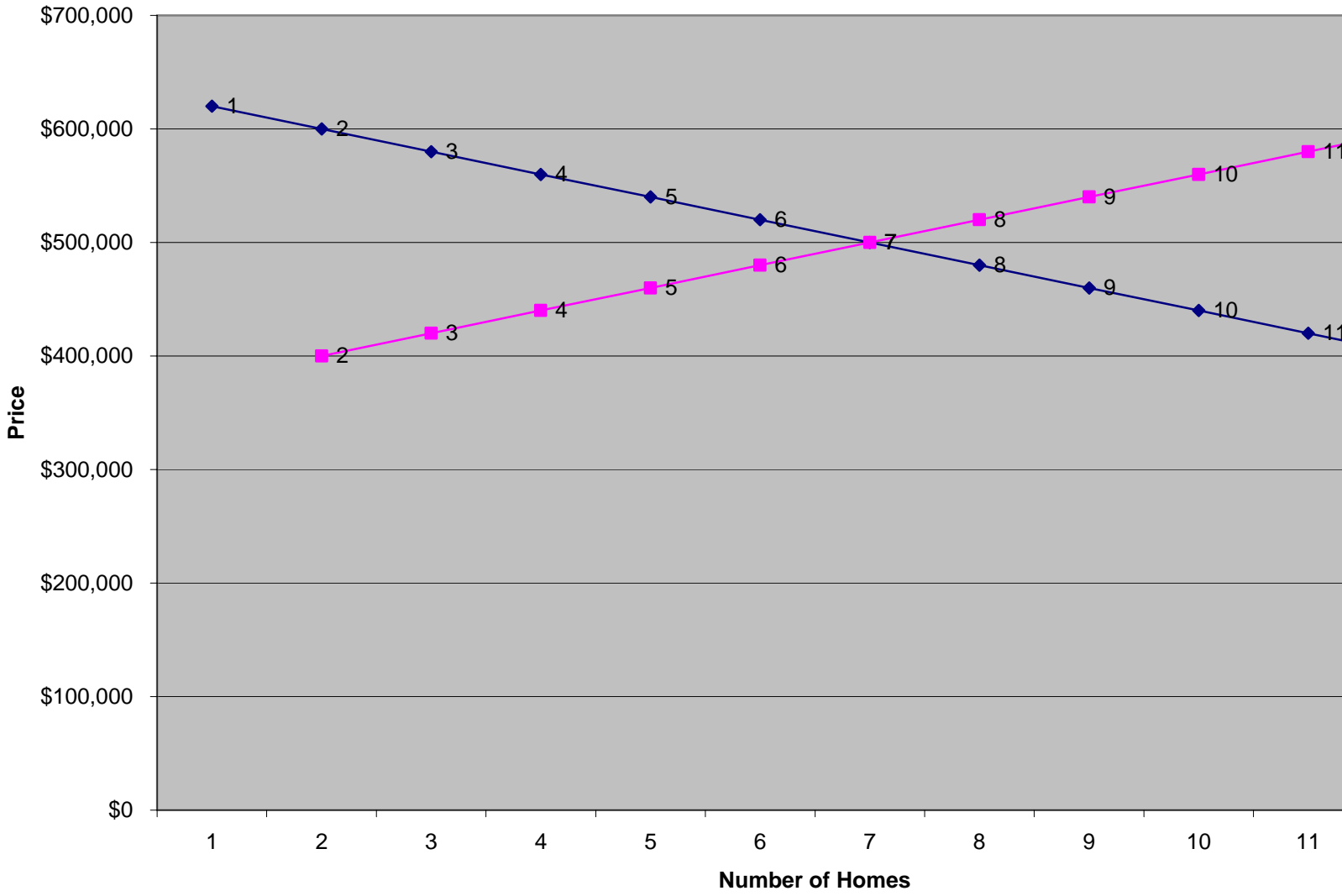
Now, we can take the two sides of the market, demand and supply, and put them together. This will allow us to determine the quantity produced and the price of the product. In the graph on the following page, the demand curve and the supply curve have been superimposed on each other. They reflect the demand and supply schedules that we had before.

	<u>Price</u>	<u>Quantity Demanded</u>	<u>Quantity Supplied</u>
1	\$640,000	0	14,000
2	\$620,000	1000	13,000
3	\$600,000	2000	12,000
4	\$580,000	3000	11,000
5	\$560,000	4000	10,000
6	\$540,000	5000	9,000
7	\$520,000	6000	8,000
8	\$500,000	7000	7,000
9	\$480,000	8000	6,000
10	\$460,000	9000	5,000
11	\$440,000	10000	4,000
12	\$420,000	11000	3,000
13	\$400,000	12000	2,000

Assume that, for whatever reason, the price is \$600,000 per home. The demand curve tells us that buyers wish to buy 2,000 homes (point 3). The supply curve tells us sellers wish to sell 12,000 homes (point 3). We have a problem. There are 10,000 homes that sellers wish to sell that no one wishes to buy (12,000 - 2,000). This is called a **surplus**. Graphs may seem abstract but surpluses are not. A seller knows there is a surplus by the fact that goods for sale are not selling. Resale homes go on sale and sit for months and months without any buyer making an offer. New homes have the "Grand Opening" flags out for months and even years. Eventually, sellers figure out that they must **lower the price**. As the price falls, buyers will buy more (a movement along the demand curve). Sellers may even choose to sell less at the lower price, taking homes off the market (a movement along the supply curve). The surplus becomes smaller and smaller until it disappears.

Now assume that the price begins at \$400,000 per home. The demand curve tells us that buyers wish to buy 12,000 homes (point 13). The supply curve tells us that sellers wish to sell 2,000 homes (point 13). We have a problem. All 2,000 homes for sale will sell quickly and many more buyers will come seeking to buy. We call this a **shortage**. A shortage is also easy to recognize. Homes go on sale for a minimum price of \$800,000. A week before orders were to be taken, about 500 people line up to spend a week in line. It was easy for sellers to realize that there was a shortage. \$800,000 per home may have seemed a high price. Obviously it was not.

### Equilibrium



As a result, **sellers raise the price**. The higher price will cause buyers to buy less (move along the demand curve). It may also induce sellers to sell more homes (move along the supply curve). The shortage becomes smaller and smaller until it disappears.

At the price of \$500,000 (point 8), there is no surplus. There is also no shortage. Sellers want to sell 7,000 homes. This is exactly what buyers want to buy. There is no reason to either lower or raise the price. We call \$500,000 **the equilibrium price**. We call 7,000 homes **the equilibrium quantity**. The demand and the supply are equal. All forces affecting the price or quantity are in balance; there is no tendency to change. We started our analysis by asking what determined the quantity produced and the price of the product. We now know that the quantity produced will be 7,000 homes and the price will be \$500,000 per home. The price and the quantity of homes will stay at these levels until something happens to change them.

### Test Your Understanding

The following are demand and supply schedules for computers:

If the Price is:	The Quantity Demanded is:	and	The Quantity Supplied is:
\$1000	500		100
\$1250	400		200
\$1500	300		300
\$1750	200		400
\$2000	100		500

The equilibrium price is \$\_\_\_\_\_ and the equilibrium quantity is \_\_\_\_\_. If the price were \$2000, there would be a \_\_\_\_\_ (shortage or surplus?) equal to \_\_\_\_\_ computers.

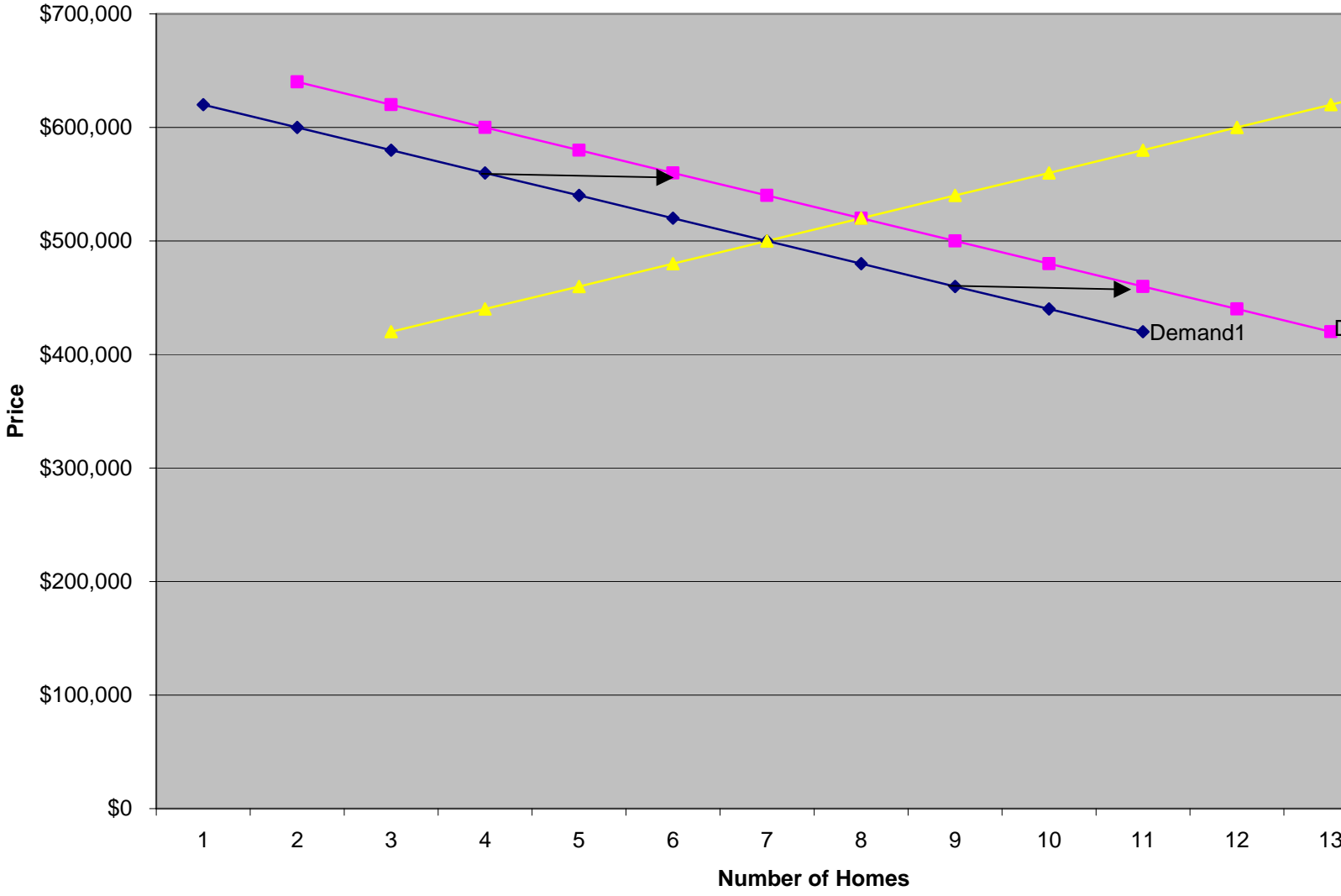
### 3. Changes in Equilibrium

**Case 1:** Assume that we begin with a market for homes in equilibrium. Then, something changes. Let us assume that **income rises**. How do we analyze this case?

Does income affect demand or supply? The answer, as we saw in the last chapter, is **demand**. Will there be a shift or movement along demand? The answer is **shift**, because the change is caused by something other than the price. Is the shift right or left? The demand will increase, which is a shift to the **right**. The data below are repeated.

	<u>If the price is:</u>	<u>The quantity demanded is:</u>		<u>The quantity supplied is</u>
		<u>Income = \$50,000</u>	<u>Income = \$100,000</u>	
1	\$640,000	0	2000	14000
2	\$620,000	1000	3000	13000
3	\$600,000	2000	4000	12000
4	\$580,000	3000	5000	11000
5	\$560,000	4000	6000	10000
6	\$540,000	5000	7000	9000
7	\$520,000	6000	8000	8000
8	\$500,000	7000	9000	7000
9	\$480,000	8000	10000	6000
10	\$460,000	9000	11000	5000
11	\$440,000	10000	12000	4000
12	\$420,000	11000	13000	3000

### Demand Shifts to the Right



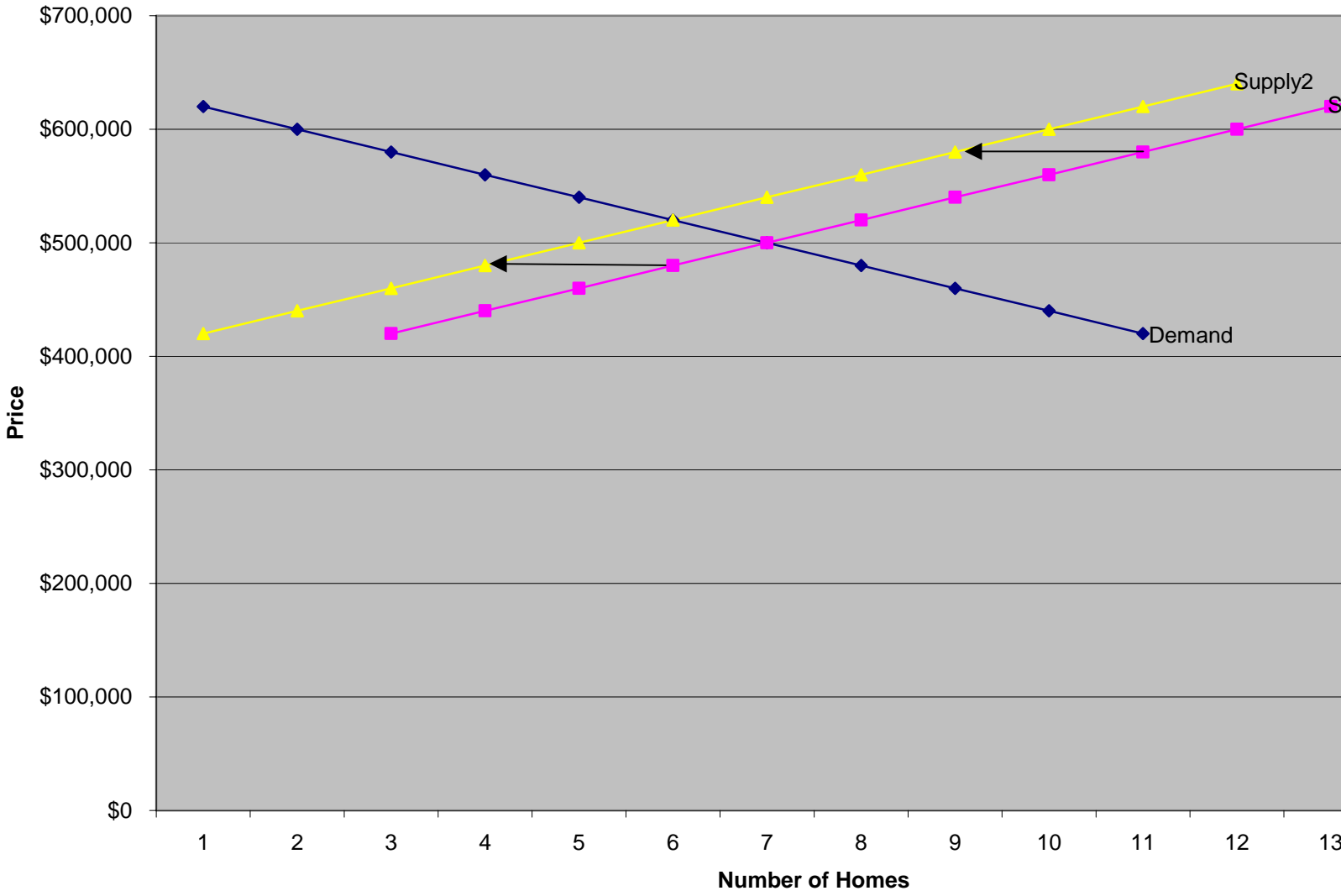
The demand shifts from the black line to the red line. Just looking at the data and at the graph tells us that there will be a new equilibrium price and quantity. **The equilibrium price will rise to \$520,000 and the equilibrium quantity will rise to 8,000 homes.** With the aid of the numbers and the graph, we can explain what occurs. Buyers wish to buy more homes (9000) at the price of \$500,000 per home because they have more income. But there are no more homes to buy (7000). This causes a shortage to result (a shortage of 2000 homes). Recognizing the shortage, sellers will raise the price (from \$500,000 to \$520,000). As the price rises, sellers will desire to sell more homes (from 7000 homes to 8000 homes). And buyers will buy fewer homes (from 9000 homes back to 8000 homes). The shortage will be eliminated.

**Case 2:** Again, assume that there is a market for homes that begins in equilibrium. In this case, the change that occurs is **an increase in the price of wood.** How do we analyze this case?

Since wood is used to build homes, this is **an increase in a cost of production.** Do costs of production affect the demand or the supply? The answer, as shown earlier in this chapter, is **supply.** Will there be a shift in or movement along the supply? The answer is a **shift**, since the cause is something other than the price of the product. Will the shift be right or left? Since costs are increasing, **supply will decrease --- a shift to the left.**

	<u>If the price is:</u>	<u>quantity demanded is:</u>	<u>quantity supplied is:</u>	<u>new quantity supplied is:</u>
1	\$640,000	0	14000	12000
2	\$620,000	1000	13000	11000
3	\$600,000	2000	12000	10000
4	\$580,000	3000	11000	9000
5	\$560,000	4000	10000	8000
6	\$540,000	5000	9000	7000
7	\$520,000	6000	8000	6000
8	\$500,000	7000	7000	5000
9	\$480,000	8000	6000	4000
10	\$460,000	9000	5000	3000
11	\$440,000	10000	4000	2000
12	\$420,000	11000	3000	1000

### Supply Shifts Left

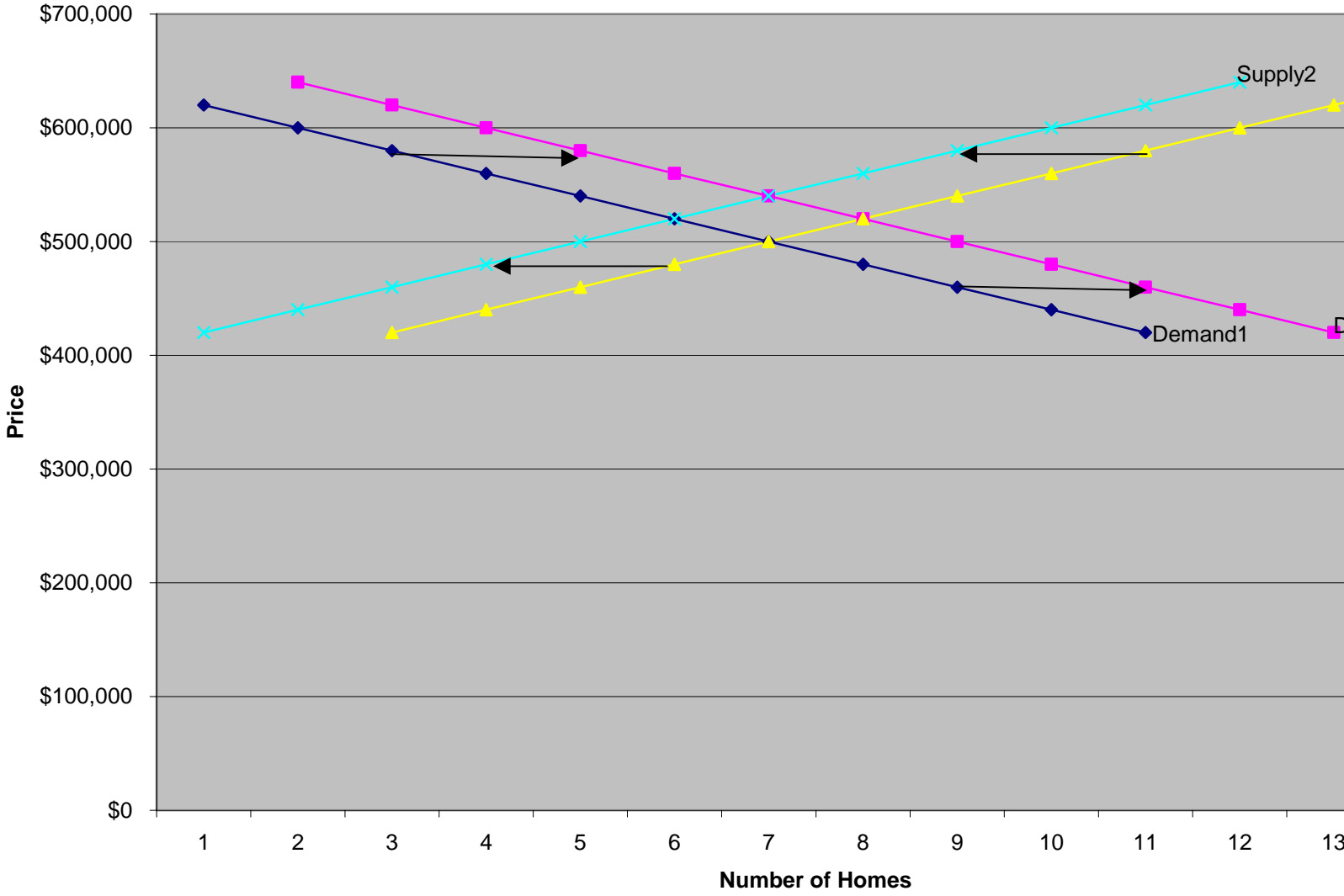


The supply curve shifts from the red line to the yellow line. From looking at the numbers and the graph, you can see that **the price of homes will rise to \$220,000 while the quantity of homes will fall to 6,000**. With the aid of the numbers and the graph, we can explain what occurs. As costs rise, selling homes becomes less profitable. Sellers wish to sell less (shift from Supply<sub>1</sub> to Supply<sub>2</sub> --- from 7000 homes to 5000 homes). But, buyers still want the same number of homes (7000 homes). The result is the creation of a **shortage** (of 2000 homes). Recognizing the shortage, sellers will raise the price (from \$500,000 to \$520,000). As the price rises, buyers will buy fewer homes (from 7,000 to 6,000) while sellers will sell more homes (from 5000 homes to 6000 homes). The shortage will be eliminated.

**Case 3:** Again, assume that the market for homes begins in equilibrium. In this case, the change that occurs is that **buyers and sellers both expect the price to rise soon**. How do we analyze this case?

In this case, both buyers and sellers are affected. Since the case involves expectations, both the demand curve and the supply curve will shift. **The demand curve shifts to the right because buyers will want to buy more homes now, before the price rises. The supply curve shifts to the left because sellers will want to pull their homes off the market and wait for the price to rise.** As shown in the graph below, if the demand curve shifts to the right and the supply curve shifts to the left, **we know without doubt that the price of homes will rise.** By itself, an increase in the demand for homes will make the price of homes rise. By itself, a decrease in the supply of homes will make the price of homes rise. So the price of homes will definitely rise. **But we cannot say definitively what will happen to the quantity of homes.** By itself, an increase in the demand for homes will make the quantity of homes rise. By itself, a decrease in the supply of homes will make the quantity of homes fall. If both happen simultaneously, we cannot know what will happen to the quantity of homes unless we know which of the two shifts is greater.

### Demand and Supply Both Shift



### Test Your Understanding

1. Assume that the market for automobiles begins in equilibrium. Draw the demand and supply curves for automobiles in the graph below. Label all axes and curves. Show the equilibrium price and quantity.

Then, the **price of gasoline rises**. Make the appropriate change on the graph on the next page. Show the new equilibrium.

When the new equilibrium is reached, the price will have \_\_\_\_\_(risen or fallen?) and the quantity will have \_\_\_\_\_(risen or fallen?)

Price



2. Assume that the market for oranges begins in equilibrium. Draw the demand and supply curves for oranges in the graph below. Label all axes and curves. Show the equilibrium price and quantity.

Then, **there is an increase in the price of water growers must pay**. Water, of course, is needed to grow oranges. Make the appropriate change on the graph. Show the new equilibrium.

When the new equilibrium is reached, the price will have \_\_\_\_\_(risen or fallen?) and the quantity will have \_\_\_\_\_(risen or fallen?)

Price



3. Do the same type of analysis for an increase in rents charged on apartments.. The product is homes. Use your own graph.

4. Do the same type of analysis for an increase in interest rates paid to borrow money to buy homes. Use your own graph.

5. Do the same type of analysis if the number of homebuilders is reduced as some companies go out of business. Use your own graph.

## 4. Summary

This chapter first examined the behavior of sellers. It started with the fact that sellers respond to changes in the price of the product. When the price of the product rises, the quantity supplied rises. And when the price of the product falls, the quantity supplied falls. This is called the Law of Supply. The chapter also explained the four determinants of supply. (1) As costs of production rise (fall), the supply of a product falls (rises). (2) As the number of sellers rises (falls), the supply rises (falls). (3) As the price of a different product also produced by the seller rises (falls), the supply of the product in question falls (rises). And finally (4), as sellers expect the price to rise (fall) in the future, the supply of the product on the market today falls (rises).

In the second part, this chapter illustrated how markets reach an equilibrium price and an equilibrium quantity. When there are shortages, the price will rise until the shortages are eliminated. When there are surpluses, the price will fall until the surpluses are eliminated. When something occurs to change either the demand for the product or the supply of the product, the equilibrium is disturbed temporarily. However, a new and different equilibrium price and quantity will occur. From this analysis of the response to a change in either the demand for or the supply of a product, we can learn much about two markets that are of great importance – the foreign exchange market and the stock market. These are the topics of the next chapter.

### Practice Quiz for Chapter 6

- The **law of supply** states that, other things being unchanged,
  - as the price rises, the quantity supplied rises
  - as the price rises, the quantity supplied falls
  - as the supply rises, the price falls
  - as the demand rises, the supply falls

For questions 2, 3, 4, 5, and 6, answer (a) if there is a movement along the supply curve, (b) if the supply curve shifts to the left, and (c) if the supply curve shifts to the right.

- The product is electricity and there is an increase in the price of electricity.
- The product is automobiles and there is a technical change making automobile workers more productive.
- The product is fast food and there is an increase in the minimum wage paid to fast food workers.
- The product is shares of stock. Stockholders believe that the price of the stock will fall soon.
- The product is computer operating systems and there is an increase in the number of companies producing computer operating systems.

- Using the numbers below, what is the **equilibrium price**?

Price	Demand	Supply
\$1	10	6
\$2	9	7
\$3	8	8
\$4	7	9

- 1
  - 2
  - 3
  - 4
- If the price is **below equilibrium**,
    - quantity demanded equals quantity supplied
    - there are shortages
    - there are surpluses
    - supply must shift to the right

9. Assume that a market begins in equilibrium. Then, there is **an increase in buyers' incomes**. When the new equilibrium is reached:

- a. the price and the quantity will both have risen
- b. the price and the quantity will both have fallen
- c. the price will have risen and the quantity will have fallen
- d. the price will have fallen and the quantity will have risen

10. Assume that a market begins in equilibrium. Then, there is **an increase in a cost of production**. When the new equilibrium is reached:

- a. the price and the quantity will both have risen
- b. the price and the quantity will both have fallen
- c. the price will have risen and the quantity will have fallen
- d. the price will have fallen and the quantity will have risen

Answers: 1. A 2. A 3. C 4. B 5. C 6. C 7. C 8. B 9. A 10. C