Multiple Choice:

1. In Equation (1) (in the text), the fact that the coefficient for the price of potatoes is a positive number provides information about the relationship between potatoes and corn. It tells you that corn and potatoes are:
a. substitutes
b. complements
c. unrelated goods
d. none of the above

2. Only one thing can cause a <u>movement along</u> the demand curve (instead of a <u>shift</u> in the demand curve):
a. change in the price of the product shown in the demand graph (the product's own price)
b. change in the price of a substitute good
c. change in the price of a complement
d. change in income

3. Use the demand function for corn in-text Exercise 2.1 when the price of potatoes is $.25, the price of butter is $2. Use the graph to find the price of corn at which consumers demand 7 billion bushels per year.
a. 2
b. 3
c. 3.5
d. 5

4. Figure 1 provides a graph of the demand for corn (in-text Exercise 2.1) when the price of potatoes is $.25, the price of butter is $2. The slope of this line is:
a. - 1/2
b. 1
c. 2
d. none of the above

5.

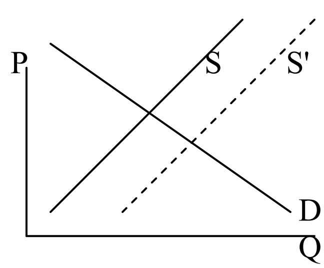


Figure 1

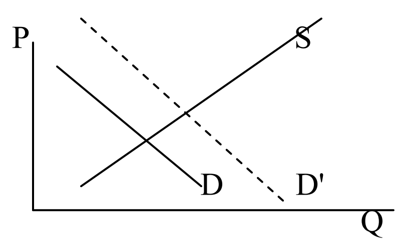
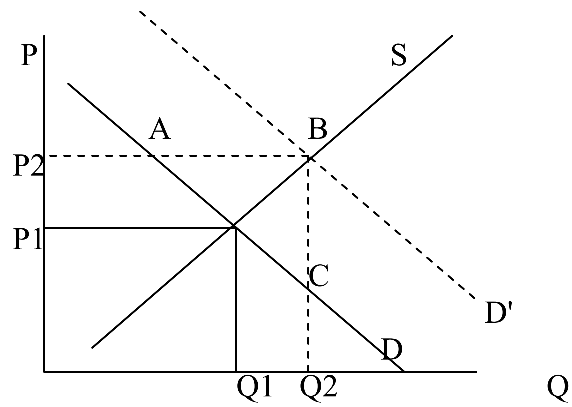


Figure 2

Which of the following statements is correct?
a. Figure 1 correctly illustrates the impact of an increase in the price of an important input.
b. Figure 2 correctly illustrates the impact of an decrease in the price of a substitute.

c. both of the above
d. none of the above

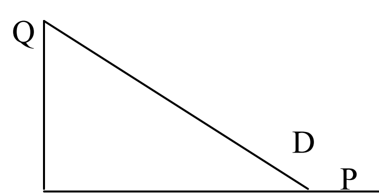
6.



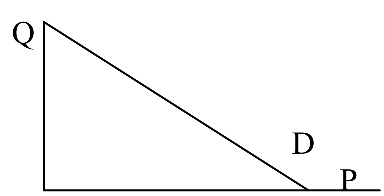
This graph correctly illustrates a movement along the supply curve that results when the product price is increased from P1 to P2. Note that the supply curve does not shift. Some students find this puzzling because their intuition tells them that producers will respond to the price increase by increasing production. That increase in quantity is shown in Figure 1 by:
a. A shift that will occur in the future (not illustrated on this graph).
b. the vertical distance between P1 and P2
c. the horizontal distance from Q1 to Q2
d. the area of the triangle ABC

7. The demand equation noted in In-text Exercise 2.2 is Q = 20 – 2P. Which of the following statements is true?

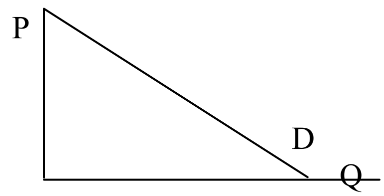
a. If we use the following graph to illustrate the demand curve, then the slope of this demand curve is -2.



b. If we use the following graph to illustrate the demand curve, then the slope of this demand curve is -1/2.



c. If we use the following graph to illustrate the demand curve, then the slope of this demand curve is -2.



d. Both a and c.

8. Application 2.3 states that hurricanes destroyed 40% of the Florida orange crop in the 2003-2004 growing season. Price increased 50%. The elasticity of demand is:
a. e = -5/4
b. e = -4/5
c. e = -1
d. e = 0 because consumers can purchase oranges grown in California

9. Worked-Out problem 2.3 states that the elasticity of demand is -.46 when price is \$2.51, and elasticity is -.59 when price increases to \$2.92. For linear demand curves, why does the absolute value of elasticity increase when price increases? (Hint: Note that Equation 6 can be rewritten as E^d = slope * P/Q for a linear demand curve).

a. For a linear demand curve, the slope is the same at each point along the line. For the demand curve used in this problem, the slope is $\Delta Q/\Delta P = -73.17$.
b. As we move up the demand curve from point A to point B, P increases and Q decreases. P/Q is larger at point B than point C. Therefore, as we move up a linear demand curve, the absolute value of elasticity will always increase.
c. Both a and b.
d. None of the above

10. Application 2.5 states that the elasticity of demand for a Honda Accord was -4.8. If Honda increases the price of the Accord, what would happen to total revenue from Accord sales?
a. Total revenue would increase
b. Total revenue would decrease
c. Total revenue would not change
d. There is not enough information to answer this question.

Answers to Multiple Choice

1a, 2a, 3c, 4a, 5d, 6c, 7a, 8b, 9c, 10b

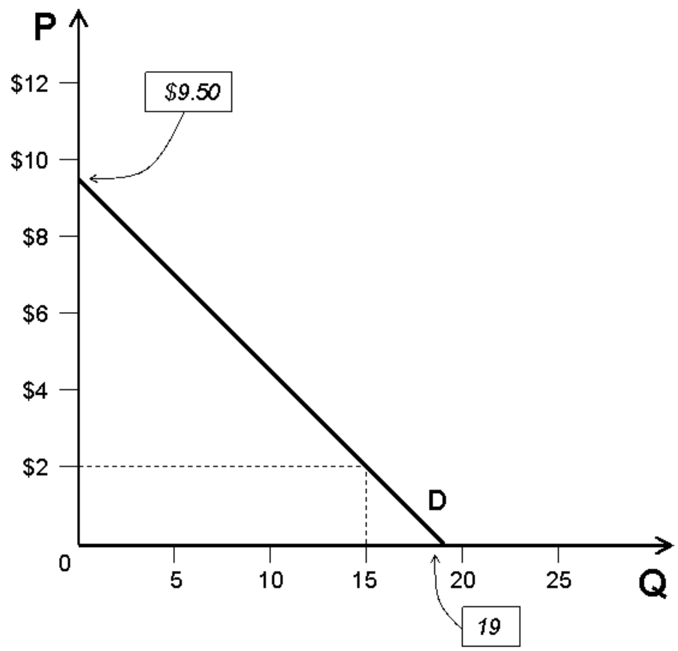
Answers to End-of-Chapter Questions

2.1

First, we should plug the exogenous variables into the demand function, so that it gives quantity demanded as a function of only price.

$Q^d_{corn} = 5 - 2P_{corn} + 4P_{potatoes} - 0.25P_{butter} + .0003M$
$Q^d_{corn} = 5 - 2P_{corn} + 4(0.75) - 0.25(4.00) + .0003(40,000)$
$Q^d_{corn} = 5 - 2P_{corn} + 3 - 1 + 12$
$\boldsymbol{Q^d_{corn} = 19 - 2P_{corn}}$

Graphing a linear demand curve is most easily done by finding the *x*- and *y*-intercepts. If corn were free (P_{corn} = \$0.00), consumers would want 19 billion bushels per year. The price that would make consumers want to purchase no corn whatsoever is found by plugging in 0 for Q^d_{corn}. Solving yields P_{corn} = \$9.50. This curve can be drawn by plotting those two points and drawing the straight line that connects them:



It looks from the drawing like quantity demanded equals 15 billion bushels a year at a price of \$2.00, but we can confirm this algebraically by plugging 15 in for $Q^d corn$ and solving for P_{corn}.

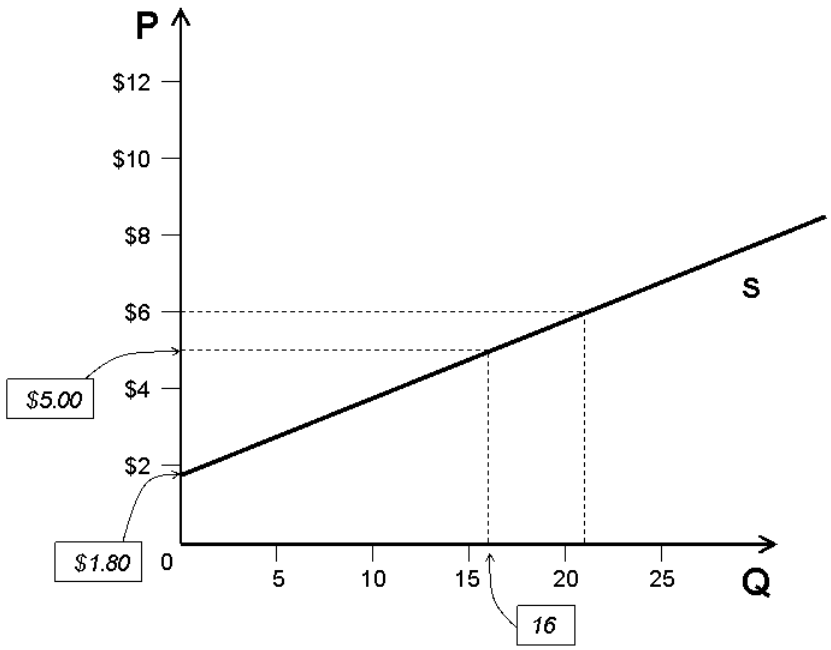
$Q^d_{corn} = 19 - 2P_{corn}$
$15 = 19 - 2P_{corn}$
$2P_{corn} = 4$
$\boldsymbol{P_{corn} = 2}$

2.2

The solution method to this question is very similar to that for 2.1. First, we plug in endogenous variables to create a function of only P_{corn}:

$Q^s_{corn} = 9 + 5P_{corn} - 2P_{fuel} - 1.25P_{soybeans}$
$Q^s_{corn} = 9 + 5P_{corn} - 2(2.75) - 1.25(10)$
$Q^s_{corn} = 9 + 5P_{corn} - 5.50 - 12.50$
$\boldsymbol{Q^s_{corn} = 5P_{corn} - 9}$

Graphing a linear supply curve is not quite as simple as graphing a linear demand curve (because it is upward-sloping, it only has one positive intercept). We can still find the price that will cause suppliers to supply no corn by plugging 0 in for Q^s_{corn} and solving for P_{corn}. If we do that, we get P_{corn} = 1.80. Now we just need any other point, which we can get by plugging in anything higher than 1.80 for P_{corn}, or by plugging any positive number in for Q^s_{corn}. Suppose we plug 5.00 in for the price and see that Q^s_{corn} = 16.



It looks from the drawing like quantity supplied equals 21 billion bushels a year at a price of $6.00, but we can confirm this algebraically by plugging 21 in for $Q^s corn$ and solving for P_{corn}.

$Q^s_{corn} = 5P_{corn} - 9$
$21 = 5P_{corn} - 9$
$30 = 5P_{corn}$
$\mathbf{6 = P_{corn}}$

2.3
Using the already simplified supply and demand functions from 2.1 and 2.2, all we need to do is set $Q^s_{corn} = Q^d_{corn}$.

$Q^s_{corn} = Q^d_{corn}$
$5P_{corn} - 9 = 19 - 2P_{corn}$
$7P_{corn} = 28$
$\mathbf{P_{corn} = 4.00}$

The equilibrium price is 4.00. Plugging 4.00 into either Q^s_{corn} or Q^d_{corn} will give the equilibrium quantity, which is 11.

$Q^s_{corn} = 5P_{corn} - 9$
$Q^s_{corn} = 5(4.00) - 9$
$Q^s_{corn} = 20 - 9$
$\mathbf{Q^s_{corn} = 11}$

$Q^d_{corn} = 19 - 2P_{corn}$
$Q^d_{corn} = 19 - 2(4.00)$
$Q^d_{corn} = 19 - 8$
$\mathbf{Q^d_{corn} = 11}$

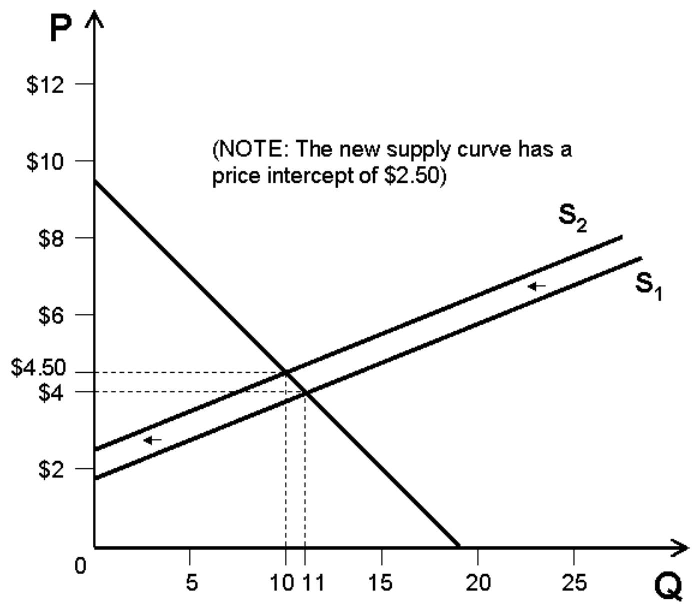
If the price of diesel fuel were to increase to \$4.50 per gallon, it would shift the supply curve. Going back to the original:

$Q^s_{corn} = 9 + 5P_{corn} - 2P_{fuel} - 1.25P_{soybeans}$
$Q^s_{corn} = 9 + 5P_{corn} - 2(4.50) - 1.25(10)$
$Q^s_{corn} = 9 + 5P_{corn} - 9 - 12.50$
$\boldsymbol{Q^s_{corn} = 5P_{corn} - 12.50}$

Solving for the new equilibrium is just like before:

$Q^s_{corn} = Q^d_{corn}$
$5P_{corn} - 12.50 = 19 - 2P_{corn}$
$7P_{corn} = 31.50$
$\boldsymbol{P_{corn} = 4.50}$

The new equilibrium price is 4.50. Plugging 4.50 into either Q^s_{corn} or Q^d_{corn} will give the new equilibrium quantity, which is 10.



$Q^s_{corn} = 5P_{corn} - 12.50$
$Q^s_{corn} = 5(4.50) - 12.50$
$Q^s_{corn} = 22.50 - 12.50$
$\boldsymbol{Q^s_{corn} = 10}$

$Q^d_{corn} = 19 - 2P_{corn}$
$Q^d_{corn} = 19 - 2(4.50)$
$Q^d_{corn} = 19 - 9$
$\boldsymbol{Q^d_{corn} = 10}$

2.4

Because this government purchase is determined by the relief plan, and is not in response to market prices, this decision to purchase 3.5 billion bushels shifts the demand curve to the right. In other words, at every possible price, the quantity of corn demanded will be 3.5 billion bushels higher. We can show this change by adding 3.5 to the demand curve for corn. This change does not affect the supply curve.

Previously, we had $Q^d_{corn} = 15 - 2P_{corn}$. After we add this government purchase, we have $Q^d_{corn} = 15 - 2P_{corn} + 3.5$, or $Q^d_{corn} = 18.5 - 2P_{corn}$. Supply remains $Q^s_{corn} = 5P_{corn} - 6$.

The first step is the same as in previous problems:

$Q^s_{corn} = Q^d_{corn}$
$5P_{corn} - 6 = 18.5 - 2P_{corn}$
$7P_{corn} = 24.50$
$\boldsymbol{P_{corn} = 3.50}$

The new equilibrium price of corn is 3.50. The price has gone up because of the increase in demand; corn is now more valuable than before. Plugging 3.50 into either Q^s_{corn} or the new Q^d_{corn} will give the new equilibrium quantity, which is 11.5.

$Q^s_{corn} = 5P_{corn} - 6$	$Q^d_{corn} = 18.5 - 2P_{corn}$
$Q^s_{corn} = 5(3.50) - 6$	$Q^d_{corn} = 18.5 - 2(3.50)$
$Q^s_{corn} = 17.50 - 6$	$Q^d_{corn} = 18.5 - 7$
$\mathbf{Q^s_{corn} = 11.5}$	$\mathbf{Q^d_{corn} = 11.5}$

2.5
The destruction of the World Trade Center caused a change in both the supply of and the demand for office space in Manhattan. The change in supply was a physical reduction in the available space; the change in demand came from worry from businesspeople about issues of safety. When both supply and demand decrease in this way, the effect on quantity is obvious: there will be less office space rented in Manhattan. What is not clear is the effect on price. If the decrease in supply were greater than the decrease in demand, price would rise; if the other way around, price would fall.

In the long run, after office space is rebuilt, the supply curve would shift back out to (or closer to) its original position. If demand never rebounded, then this would cause an overall reduction in the price of office space.

However, if the area around the World Trade Center were turned into a park, the decrease in supply would be permanent. Further, if demand were to rebound (say because the park causes a lower density of office space, making it a less likely target for another attack, thereby alleviating concerns), this would mean a higher price in the long run. Those who owned the office space not destroyed by the attacks would be the “winners,” as they would see their prices rise. The “losers” would be those who pay higher rents for their office space.

2.6
A ban on Canadian beef would lower the supply of beef available to US consumers, which would cause an increase in the price of beef. Initially, before the price changes, there will not be enough beef to satisfy demand. This will cause upward pressure on prices, driving some consumers out of the market, and leading some suppliers into the market. Depending on how much of the beef being sold in the US was Canadian beef, the increase could be great. Americans will reduce their beef consumption (though more Americans are producing beef than before).

In Canada, beef producers would be supplying too much beef to the market, with no one to buy it. This will cause downward pressure on prices. Because of the decrease in price, some Canadian consumers will enter the market and some producers will leave the market. Canadians will consume more beef (and produce less).

Unless US consumers believed that the health risk associated with Canadian beef also implied health risks associated with US-produced beef, the analysis for the US would not be any different. If US consumers did believe that all beef was unsafe, this would cause a decrease in the demand for beef, which would reverse the price-increasing trend of the ban (making the final effect on price ambiguous) while further reducing beef consumption.

If Canadian consumers believed that their beef was unsafe, there would also be a decrease in demand. This would counter the trend toward consuming more beef (so that the final effect on beef consumption would be ambiguous, but it would further reduce the price.

2.7

Recalling the formula for elasticity of demand (when working with a linear demand curve) is $E^d = –B(P/Q)$ or $E^d = –B(P/(A – BP))$, we can just substitute our numbers into the formula. Based on the demand function, $A = 6000$ and $B = 30$.

$$E^d = -B\left(\frac{P}{A - BP}\right)$$

$$E^d = -30\left(\frac{75}{6000 - (30 \times 75)}\right)$$

$$E^d = -30\left(\frac{75}{6000 - (30 \times 75)}\right)$$

$$E^d = –0.6$$

2.8

The largest total expenditure occurs when price elasticity of demand equals –1.

$$E^d = -B\left(\frac{P}{A - BP}\right)$$

$$-1 = -30\left(\frac{P}{6000 - 30P}\right)$$

Multiplying both sides by $6000 – 30P$ yields:

$30P – 6000 = –30P$
$60P = 6000$
$\boldsymbol{P = 100}$

2.9

We are told that the demand curve for jelly beans in Cincinnati is linear, but we are not given the demand function, so we cannot use the same version of the formula for elasticity of demand that we used in 2.8. We must use the formula the way it is written in (4) on page 48. To calculate the changes in *Q* and *P*, we use the numbers from both years. Since we're interested in the elasticity at last year's price of \$2, we plug in last year's values for *P* and *Q*.

$$E^d = \left(\frac{\Delta Q}{\Delta P}\right)\left(\frac{P}{Q}\right) = \left(\frac{100{,}000 - 50{,}000}{\$1.00 - \$2.00}\right)\left(\frac{P}{Q}\right) = \left(\frac{50{,}000}{-\$1.00}\right)\left(\frac{P}{Q}\right) = \left(\frac{50{,}000}{-\$1.00}\right)\left(\frac{\$2}{50.000}\right) = -2$$

The elasticity of demand last year was –2. To figure out at what price the expenditure on jelly beans would have been the highest, we need to figure out at what price the elasticity of demand would have been equal to –1.

In order to do the second part of this problem, we will need to know the demand function. We can notice from above that for this linear demand curve, *B* is 50,000, because a \$1 increase in price reduced Q^d by 50,000. (Also we could calculate the slope as change in Q^d over change in *P*, as is done above, and arrive at the same result.) So now that leaves just *A* left to calculate. To do this, we can plug one of our two points into the demand function and solve for *A*:

$Q^d = A - 50{,}000P$		$Q^d = A - 50{,}000P$
$100{,}000 = A - 50{,}000(1)$	or	$50{,}000 = A - 50{,}000(2)$
150,000 = *A*		**150,000 = *A***

Now we have enough information to use the formula for elasticity of demand the way it's written in Worked-Out problem 2.4 on page 53:

$$E^d = -B\left(\frac{P}{A - BP}\right)$$

$$-1 = -50000\left(\frac{P}{150{,}000 - 50{,}000P}\right)$$

Multiplying both sides by 150,000 – 50,000*P* yields:

$50{,}000P - 150{,}000 = -50{,}000P$
$100{,}000P = 150{,}000$
$\mathbf{P = 1.50}$

2.10
For in-text exercise 2.2 on page 33, the demand and supply functions and the equilibrium price and quantity are as follows:

$Q^d_{corn} = 20 - 2P_{corn}$ $Q^s_{corn} = 1.6P_{corn} - 7$
Equilibrium: $P_{corn} = 7.50$, $Q_{corn} = 5$

To find the elasticity of demand, we can use almost any version of the formula for the elasticity of demand. Here's what it looks like if the student uses the formula for elasticity of demand the way it's written in Worked-Out problem 2.4 on page 53:

$$E^d = -B\left(\frac{P}{A - BP}\right)$$
$$E^d = -2\left(\frac{7.50}{20 - 2(7.50)}\right)$$
$\boldsymbol{E^d = -3}$

To find the elasticity of supply, we use formula (7) on page 54, using the slope of the supply function, 1.6, for $(\Delta Q / \Delta P)$:

$$E^s = \left(\frac{\Delta Q}{\Delta P}\right)\left(\frac{P}{Q}\right)$$
$$E^s = (1.6)\left(\frac{7.50}{5}\right)$$
$\boldsymbol{E^s = 2.4}$

2.11
This problem is structured differently from previous problems. Here, students are given one price and quantity, and the elasticity, and asked to solve for the demand function. The best way to do this problem is to use the formula for the elasticity of demand as it's written in (5) on page 48, plugging in the numbers given in the problem (here, I assume *Q* is measured in millions of gallons, students may have plugged in 1,000,000, assuming *Q* was measured in single gallons):

$$E^s = -B\left(\frac{P}{Q}\right)$$
$$-0.5 = -B\left(\frac{2.00}{1}\right)$$

Dividing both sides by 2 yields: $-0.25 = -B$, so $\boldsymbol{B = 0.25}$.

This can be plugged into the demand function, along with *P* and *Q*, to solve for *A*:

$Q^d_{gas} = A - BP_{gas}$
$1 = A - 0.25(2.00)$
$1 = A - 0.5$
$\boldsymbol{A = 1.5}$

Therefore, the demand function is $\boldsymbol{Q^d_{gas} = 1.5 - 0.25P_{gas}}$. (If students used Q to represent one single gallon of gasoline, the demand function is $\boldsymbol{Q^d_{gas} = 1{,}500{,}000 - 250{,}000P_{gas}}$.

The largest total expenditure occurs when $E^d = -1$. To find this point, we use the formula for the elasticity of demand as it is written in Worked-Out problem 2.4 on page 53. The answer is \$3.00. (Note: the specification of Q as a single unit or as a million units will not affect this answer.)

$$E^d = -B\left(\frac{P}{A - BP}\right)$$
$$-1 = -0.25\left(\frac{P}{1.5 - 0.25P}\right)$$

Multiplying both sides by $1.5 - 0.25P$ yields:

$0.25P - 1.5 = -0.25P$
$0.5P = 1.5$
$\boldsymbol{P = 3.00}$

2.12
The demand function for the Honda Accord is:

$Q^d_A = 430 - 10P_A + 10P_C - 10P_G$

When both cars sell for \$20,000 and the price of gasoline is \$3, Q^d_A is 400.

$Q^d_A = 430 - 10(20{,}000) + 10(20{,}000) - 10(3.00) = 400$

To find the cross-price elasticities, it might be easier to rewrite the formula given on page 56 so that it looks more like (4) on page 48:

$$E^d{}_{P_O} = \left(\frac{\Delta Q}{\Delta P_O}\right)\left(\frac{P_O}{Q}\right)$$

The first term will be equal to the coefficients from the demand function for the given price. The cross-price elasticity of the Accord with respect to the price of the Camry is:

$$E^d{}_{P_O} = (10)\left(\frac{20{,}000}{400}\right)$$
$$\boldsymbol{E^d{}_{P_O} = 500}$$

Since this number is positive, the Camry must be a substitute for the Accord. The cross-price elasticity of the Accord with respect to the price of the gasoline is:

$$E^d{}_{P_O} = (-10)\left(\frac{3.00}{400}\right)$$
$$\boldsymbol{E^d{}_{P_O} = -0.075}$$

Since this number is negative, gasoline must be a complement to the Accord.

2.13
To solve for two unknowns, *A* and *B*, we need two equations. The first of these equations will be the demand function itself, with Q^d and P plugged in:

$Q^d = A - BP$
$60 = A - B(1)$
$A = B + 60$

The second equation will be the formula for elasticity, written as it is in Worked-Out problem 2.4 on page 53:

$$E^d = -B\left(\frac{P}{A - BP}\right)$$

Substituting the equation relating *A* and *B* from above gives:

$$E^d = -B\left(\frac{P}{(B+60) - BP}\right)$$

Plugging in the values for E^d and P given in the problem yields:

$$-1 = -B\left(\frac{1}{(B+60) - B(1)}\right)$$
$$-1 = -B\left(\frac{1}{60}\right)$$
$$\boldsymbol{B = 60}$$

From above, $A = B + 60$, so $\boldsymbol{A = 120}$.

The demand function, then, is $Q^d = 120 - 60P$.