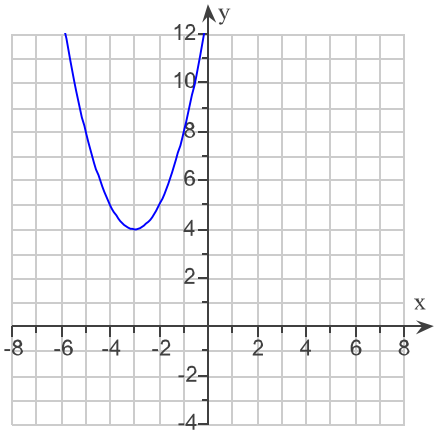
Student: James Cook **Date:** 8/19/11 **Time:** 2:48 PM	**Instructor:** James Cook **Course:** Math 121, section 3, Fall 2011 **Book:** Blitzer: College Algebra, 5e	**Assignment:** Assignment 3 (covered by Test 2)

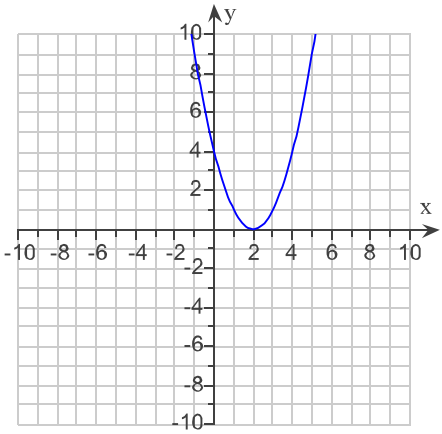
1. The graph of a quadratic function is given. Select the function's equation from the choices given.



Choose the correct equation below.

- A. $f(x) = (x+3)^2 - 4$
- B. $f(x) = (x-3)^2 - 4$
- C. $f(x) = (x+3)^2 + 4$
- D. $f(x) = (x-3)^2 + 4$

2. The graph of a quadratic function is given to the right. Write the function's equation.



Choose the correct equation below.

- A. $f(x) = x^2 + 4x + 4$
- B. $f(x) = x^2 + 2$
- C. $f(x) = x^2 - 4x + 4$
- D. $f(x) = -x^2 - 2$

3. In the following exercise, find the coordinates of the vertex for the parabola defined by the given quadratic function.

$$f(x) = -3(x+2)^2 + 1$$

The vertex is ☐. (Type an ordered pair.)

4. Find the coordinates of the vertex for the parabola defined by the given quadratic function.

$$f(x) = -x^2 - 4x + 4$$

The vertex is ☐. (Type an ordered pair.)

5. Consider the function $f(x) = 3x^2 - 18x - 8$.

a. Determine, without graphing, whether the function has a minimum value or a maximum value.
b. Find the minimum or maximum value and determine where it occurs.
c. Identify the function's domain and its range.

a. The function has a [ ] value.

b. The minimum/maximum value is [ ]. It occurs at x = [ ].

c. The domain of f is [ ]. (Type your answer in interval notation.)

The range of f is [ ]. (Type your answer in interval notation.)

6. Consider the function $f(x) = -2x^2 + 20x - 2$.

a. Determine, without graphing, whether the function has a minimum value or a maximum value.
b. Find the minimum or maximum value and determine where it occurs.
c. Identify the function's domain and its range.

a. The function has a [ ] value.

b. The minimum/maximum value is [ ]. It occurs at x = [ ].

c. The domain of f is [ ]. (Type your answer in interval notation.)

The range of f is [ ]. (Type your answer in interval notation.)

7. Consider the function $f(x) = 4x^2 - 4x$.

a. Determine, without graphing, whether the function has a minimum value or a maximum value.
b. Find the minimum or maximum value and determine where it occurs.
c. Identify the function's domain and its range.

a. The function has a [ ] value.

b. The minimum/maximum value is [ ]. It occurs at x = [ ].

c. The domain of f is [ ]. (Type your answer in interval notation.)

The range of f is [ ]. (Type your answer in interval notation.)

8. Write an equation in standard form of the parabola that has the same shape as the graph of $f(x) = 3x^2$, but with $(4,9)$ as the vertex.

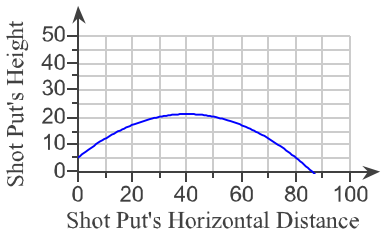
$g(x) =$ ☐ (Type your answer in standard form.)

9. Write an equation of the parabola that has the same shape as the graph of $f(x) = 6x^2$ or $g(x) = -6x^2$, but with the given minimum.

Minimum $= 0$ at $x = 12$

$h(x) =$ ☐
(Simplify your answer.)

10. An athlete whose event is the shot put releases a shot. When the shot whose path is shown by the graph to the right is released at an angle of 40°, its height, $f(x)$, in feet, can be modeled by $f(x) = -0.01x^2 + 0.8x + 5.2$, where x is the shot's horizontal distance, in feet, from its point of release. Use this model to solve parts (a) through (c) and verify your answers using the graph.



a. What is the maximum height of the shot and how far from its point of release does this occur?

The maximum height is ☐, which occurs ☐ feet from the point of release.
(Type an integer or decimal rounded to four decimal places as needed.)

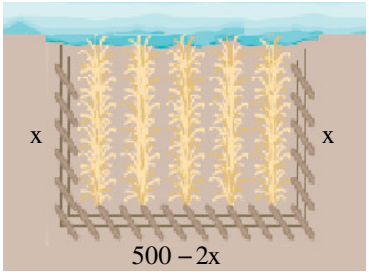
b. What is the shot's maximum horizontal distance, to the nearest tenth of a foot, or the distance of the throw?

☐ feet
(Type an integer or decimal rounded to the nearest tenth as needed.)

c. From what height was the shot released?

☐ feet
(Type an integer or decimal rounded to the nearest tenth as needed.)

11. Farmer Ed has 500 meters of fencing, and wants to enclose a rectangular plot that borders on a river. If Farmer Ed does not fence the side along the river, find the length and width of the plot that will maximize the area. What is the largest area that can be enclosed?



The width, labeled x in the figure, is ☐ meters.
(Type an integer or decimal.)

The length, labeled $500 - 2x$ in the figure, is ☐ meters.
(Type an integer or decimal.)

The largest area that can be enclosed is ☐ square meters.
(Type an integer or decimal.)

12. Alex has 3600 yards of fencing to enclose a rectangular area. Find the dimensions of the rectangle that maximize the enclosed area. What is the maximum area?

A rectangle that maximizes the enclosed area has a length of ☐ yards and a width of ☐ yards.

The maximum area is ☐ square yards.

13. A rectangular playground is to be fenced off and divided in two by another fence parallel to one side of the playground. Six hundred feet of fencing is used. Find the dimensions of the playground that maximize the total enclosed area. What is the maximum area?

The smaller dimension is ☐ feet.

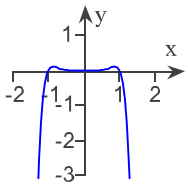
The larger dimension is ☐ feet.

The maximum area is ☐ square feet.

14. Use the leading coefficient test to determine the end behavior of the graph of the given polynomial function. Then use this end behavior to match the polynomial function with its graph.

$$f(x) = -x^8 + x^6$$

Choose the correct graph below.

A.


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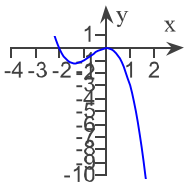

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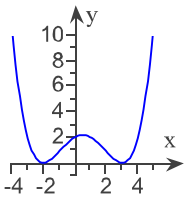

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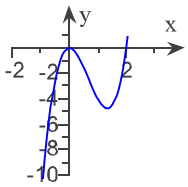
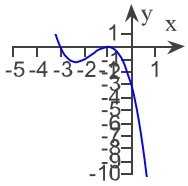


15. Use the leading coefficient test to determine the end behavior of the graph of the given polynomial function. Then use this end behavior to match the polynomial function with its graph.

$$f(x) = (x-3)^4$$

Choose the correct graph below.

A.


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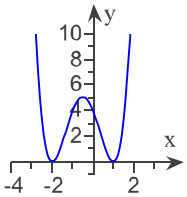

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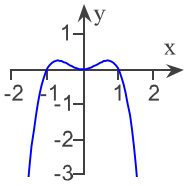

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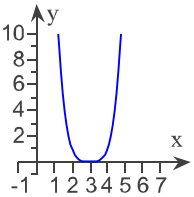


16. Use the leading coefficient test to determine the end behavior of the graph of the given polynomial function.

$$f(x) = 5x^7 - 5x^3 + 8x^2 + 1$$

A. Rises left & rises right.

B. Falls left & falls right.

C. Rises left & falls right.

D. Falls left & rises right.

E. None of the above.

17. Use the Leading Coefficient Test to determine the end behavior of the graph of the given polynomial function.

$$f(x) = 4x^6 - 3x^5 + 3x^4 + 4$$

- ○ The graph of $f(x)$ falls left and rises right.
- ○ The graph of $f(x)$ rises left and rises right.
- ○ The graph of $f(x)$ rises left and falls right.
- ○ The graph of $f(x)$ falls left and falls right.

18. Find the zeros for the polynomial function and give the multiplicity for each zero. State whether the graph crosses the x-axis or touches the x-axis and turns around at each zero.

$$f(x) = -6(x-7)(x-2)^2$$

The set of zeros is {☐}. (Use a comma to separate answers as needed.)

The multiplicity of 7 is ☐.

The multiplicity of 2 is ☐.

Does the graph of f(x) cross or touch the x-axis and turn around at the x-intercept, 7?

- ○ Touch the x-axis and turn around
- ○ Cross

Does the graph of f(x) cross or touch the x-axis and turn around at the x-intercept, 2?

- ○ Touch the x-axis and turn around
- ○ Cross

19. Find the zeros for the following polynomial function and give the multiplicity for each zero. For each zero, state whether the graph crosses the x-axis or touches the x-axis and turns around.

$$f(x) = 3(x+9)(x+2)^2$$

What is the value of the zero with the smaller multiplicity?

What is the multiplicity of this zero?

What is the behavior of the graph around this zero?

A. f(x) crosses the x-axis

B. f(x) touches the x-axis and turns around

What is the value of the other zero?

What is the multiplicity of this zero?

What is the behavior of the graph around this zero?

A. f(x) touches the x-axis and turns around

B. f(x) crosses the x-axis.

20. Find the zeros for the given polynomial function and give the mulitplicity for each zero. State whether the graph crosses the x-axis, or touches the x-axis and turns around, at each zero.

$$f(x) = x^3 - 8x^2 + 16x$$

a. The set of zeros is {☐}. (Use a comma to separate answers as needed.)

b. Multiplicity at the leftmost zero: ☐

c. Multiplicity at the rightmost zero: ☐

d. Complete the sentence.

At the leftmost zero...

- ○ the graph crosses the *x*-axis.
- ○ the graph touches the *x*-axis and turns around.

e. Complete the sentence.

At the rightmost zero...

- ○ the graph crosses the *x*-axis.
- ○ the graph touches the *x*-axis and turns around.

21. Use the intermediate value theorem to show that the polynomial has a real zero between the given integers.

$$f(x) = -3x^3 + 3x + 2; \text{ between } 1 \text{ and } 5$$

Find the value of $f(1)$.

$f(1) =$ ☐

Find the value of $f(5)$.

$f(5) =$ ☐

According to the intermediate value theorem, does f have a zero in the given interval?

- ○ No
- ○ Yes

22. Use the Intermediate Value Theorem to show that the polynomial function has a zero in the given interval.

$$f(x) = 6x^4 - 2x^2 + 3x - 1; \quad [-2, 0]$$

Enter the value of $f(-2)$.

$f(-2) =$ ☐ (Simplify.)

Enter the value of $f(0)$.

$f(0) =$ ☐ (Simplify.)

According to the Intermediate Value Theorem, does f have a zero in the given interval?

- ○ Yes
- ○ No

23. Use the given function to answer the questions that follow.

$$f(x) = -2(x-2)^2(x^2-9)$$

a) Use the Leading Coefficient Test to determine the graph's end behavior.

- The graph of f(x) falls left and falls right.
- The graph of f(x) rises left and rises right.
- The graph of f(x) falls left and rises right.
- The graph of f(x) rises left and falls right.

b) Find the x-intercepts.

x = ☐

(Use a comma to separate answers as needed.)

At which zeros does the graph of the function cross the x-axis? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. x = ☐ (Use a comma to separate answers as needed.)
- B. There is no solution.

At which zeros does the graph of the function touch the x-axis and turn around? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. x = ☐ (Use a comma to separate answers as needed.)
- B. There is no solution.

c) Find the y-intercept by computing f(0).

f(0) = ☐

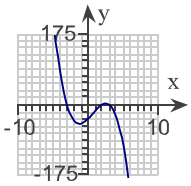
d) Determine the symmetry of the graph.

- Odd; origin symmetry
- Even; y-axis symmetry
- Neither

e) Determine the graph of the function.

23. (cont.)

A.



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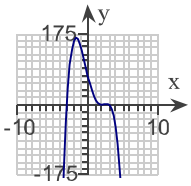

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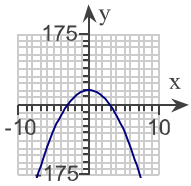

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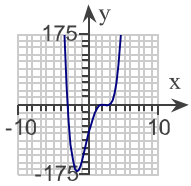


24. Use the following steps to graph the polynomial function f(x).

$$f(x) = x^3(x-3)^2(x+4)$$

a. Use the leading coefficient test to determine the graph's end behavior. What does the graph of f look like?

- A. The graph falls to the left and rises to the right.
- B. The graph rises to the left and falls to the right.
- C. The graph falls to the left and to the right.
- D. The graph rises to the left and to the right.

b. Find the x-intercepts. State whether the graph crosses the x-axis, or touches the x-axis and turns around, at each intercept.

What is/are the x-intercept(s)?

x = ☐ (Use a comma to separate answers as needed.)

What does the graph do at x = 0?

- The graph crosses the x-axis.
- The graph touches the x-axis and turns around.

What does the graph do at the rightmost zero?

- The graph crosses the x-axis.
- The graph touches the x-axis and turns around.

What does the graph do at the leftmost zero?

- The graph crosses the x-axis.
- The graph touches the x-axis and turns around.

c. Find the y-intercept.

y = ☐

d. Determine whether the graph has y-axis symmetry, origin symmetry, or neither.

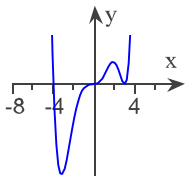
24. (cont.)

- Y-axis symmetry
- Origin symmetry
- Neither

e. If necessary, find a few additional points and graph the function. Use the maximum number of turning points to check whether it is drawn correctly.

Choose the most accurate sketch of the function.

A.



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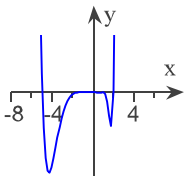
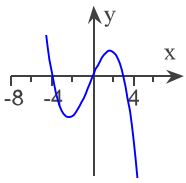


C.



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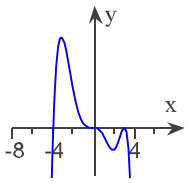


25. Use the following steps to graph the polynomial function f(x).

$$f(x) = -x^2(x-2)(x+5)$$

a. Use the leading coefficient test to determine the graph's end behavior. What does the graph of f look like?

- A. The graph falls to the left and rises to the right.
- B. The graph rises to the left and to the right.
- C. The graph rises to the left and falls to the right.
- D. The graph falls to the left and to the right.

b. Find the x-intercepts. State whether the graph crosses the x-axis, or touches the x-axis and turns around, at each intercept.

What are the x-intercept(s)?

x = ☐ (Use a comma to separate answers as needed.)

What does the graph do at x = 0?

- The graph crosses the x-axis.
- The graph touches the x-axis and turns around.

What does the graph do at the rightmost zero?

- The graph crosses the x-axis.
- The graph touches the x-axis and turns around.

What does the graph do at the leftmost zero?

- The graph crosses the x-axis.
- The graph touches the x-axis and turns around.

c. Find the y-intercept.

y = ☐

d. Determine whether the graph has y-axis symmetry, origin symmetry, or neither.

25. (cont.)

A. Y-axis symmetry

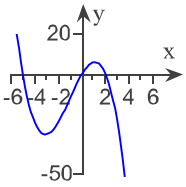
B. Origin symmetry

C. Neither

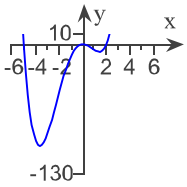
e. If necessary, find a few additional points and graph the function. Use the maximum number of turning points to check whether it is drawn correctly.

What is the graph of the function?

A.



B.



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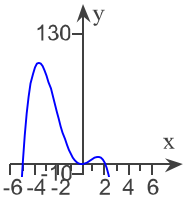
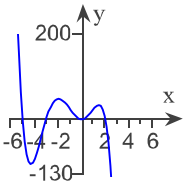


D.



26. Use the following steps to graph the polynomial function f(x).

$$f(x) = -2x^3(x-2)^2(x+6)$$

a. Use the leading coefficient test to determine the graph's end behavior. What does the graph of f look like?

- A. The graph falls to the left and rises to the right.
- B. The graph falls to the left and to the right.
- C. The graph rises to the left and falls to the right.
- D. The graph rises to the left and to the right.

b. Find the x-intercepts. State whether the graph crosses the x-axis, or touches the x-axis and turns around, at each intercept.

What is/are the x-intercept(s)?

x = ☐ (Use a comma to separate answers as needed.)

What does the graph do at x = 0?

- The graph crosses the x-axis.
- The graph touches the x-axis and turns around.

What does the graph do at the rightmost zero?

- The graph crosses the x-axis.
- The graph touches the x-axis and turns around.

What does the graph do at the leftmost zero?

- The graph crosses the x-axis.
- The graph touches the x-axis and turns around.

c. Find the y-intercept.

y = ☐

d. Determine whether the graph has y-axis symmetry, origin symmetry, or neither.

26. (cont.)

A. Y-axis symmetry

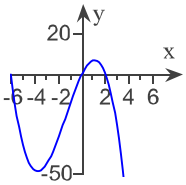
B. Origin symmetry

C. Neither

e. If necessary, find a few additional points and graph the function. Use the maximum number of turning points to check whether it is drawn correctly.

What is the graph of the function?

A.



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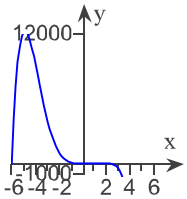

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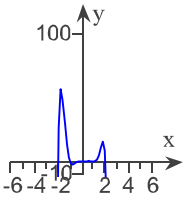
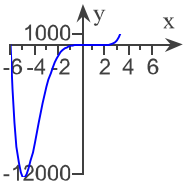


D.



27. Use the following steps to graph the polynomial function f(x).

$$f(x) = (x-4)^2(x+2)(x-1)$$

a. Use the leading coefficient test to determine the graph's end behavior. What does the graph of f look like?

A. The graph rises to the left and falls to the right.

B. The graph falls to the left and rises to the right.

C. The graph falls to the left and to the right.

D. The graph rises to the left and to the right.

b. Find the x-intercepts. State whether the graph crosses the x-axis, or touches the x-axis and turns around, at each intercept.

What is/are the x-intercept(s)?

x = ☐ (Use a comma to separate answers as needed.)

What does the graph do at x = 4?

The graph crosses the x-axis.

The graph touches the x-axis and turns around.

What does the graph do at x = −2?

The graph crosses the x-axis.

The graph touches the x-axis and turns around.

What does the graph do at x = 1?

The graph crosses the x-axis.

The graph touches the x-axis and turns around.

c. Find the y-intercept.

y = ☐

d. Determine whether the graph has y-axis symmetry, origin symmetry, or neither.

A. Y-axis symmetry

B. Origin symmetry

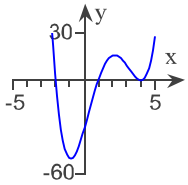
C. Neither

e. If necessary, find a few additional points and graph the function. Use the maximum number of turning points to check whether it is drawn correctly.

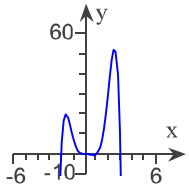
27. (cont.)

What is the graph of the function?

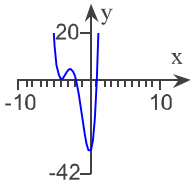
○ A.



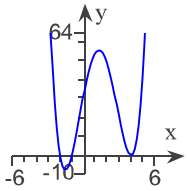
○ B.



○ C.



○ D.



28. In the following problem, divide using long division. State the quotient, $q(x)$, and the remainder, $r(x)$.

$$(x^2 + 7x + 18) \div (x + 14)$$

The quotient $q(x) = (\square)$.

The remainder $r(x)$ is $\dfrac{\square}{x + 14}$.

29. Divide.

$$(x^3 + 6x^2 + 8x + 3) \div (x + 1)$$

$(x^3 + 6x^2 + 8x + 3) \div (x + 1) = \square$

(Simplify your answer. If there is a remainder, type your answer in the form quotient + $\dfrac{\text{remainder}}{\text{divisor}}$.)

30. Divide using long division. State the quotient, $q(x)$, and the remainder, $r(x)$.

$$(9x^3 + 3x^2 + 18x - 16) \div (3x - 2)$$

$(9x^3 + 3x^2 + 18x - 16) \div (3x - 2) = \square + \dfrac{\square}{3x - 2}$

(Simplify your answers. Do not factor. Use integers or fractions for any numbers in the expressions.)

31. Divide using long division. State the quotient, $q(x)$, and the remainder, $r(x)$.

$$\frac{2x^3 + 7x^2 + 9x - 16}{x + 3}$$

$q(x) = \square$

The remainder $r(x)$ is $\dfrac{\square}{x + 3}$.

32. Divide using long division. State the quotient, q(x), and the remainder, r(x).

$$\frac{12x^4 + 10x^3 + 2x^2}{2x^2 + 1}$$

$$\frac{12x^4 + 10x^3 + 2x^2}{2x^2 + 1} = \square + \frac{\square}{2x^2 + 1}$$

(Simplify your answers. Do not factor. Use integers or fractions for any numbers in the expressions.)

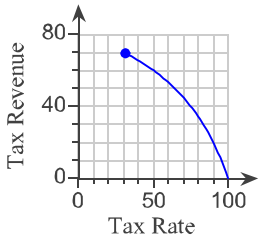
33. Solve the equation $x^3 - 5x^2 + 2x + 8 = 0$ given that -1 is a zero of $f(x) = x^3 - 5x^2 + 2x + 8$.

The solution set is $\{\square\}$. (Use a comma to separate answers as needed.)

34. Solve the equation $12x^3 + 16x^2 - 5x - 3 = 0$ given that $-\frac{3}{2}$ is a zero of $f(x) = 12x^3 + 16x^2 - 5x - 3$.

The solution set is $\{\square\}$. (Use a comma to separate answers as needed.)

35. The function $f(x) = \dfrac{120x - 12{,}000}{x - 150}$, $30 \le x \le 100$ models the tax revenue, f(x), in tens of billions of dollars, in terms of the tax rate, x. The graph of this function is shown to the right. It illustrates tax revenue decreasing dramatically as the tax rate increases. At a tax rate of 100%, the government takes all our money and no one has an incentive to work. With no income earned, zero dollars in tax revenue is generated. Complete parts (a) through (c) below.



a. Find f(30).

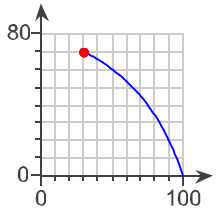
f(30) = ☐ (Round to the nearest integer as needed.)

Intepret your result. Choose the correct answer below.

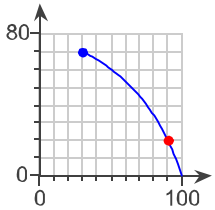
- A. When the tax rate is 83%, $300 billion in tax revenue is generated.
- B. When the tax rate is 30%, $700 billion in tax revenue is generated.
- C. If the tax rate increases 83%, an additional $300 billion in revenue is generated.
- D. If the tax rate increases 30%, an additional $700 billion in revenue is generated.

Identify the solution as a point on the graph. Choose the correct graph below.

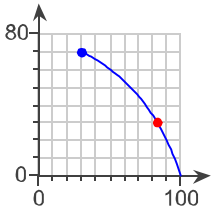
A.



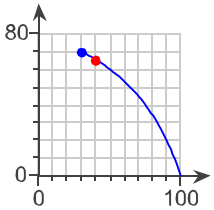
B.



C.



D.



b. Rewrite the function by using long division to perform $(120x - 12{,}000) \div (x - 150)$.

$(120x - 12{,}000) \div (x - 150) =$ ☐

(Simplify your answer. If there is a remainder, type your answer in the form quotient + $\dfrac{\text{remainder}}{\text{divisor}}$.)

Then use this new form of the function to find f(30).

f(30) = ☐ (Round to the nearest integer as needed.)

c. Is f a polynomial function? Explain your answer. Choose the correct answer below.

35. (cont.)

A. Yes, f is a polynomial function because it can be written in the form $f(x) = a_n x^n + a_{n-1}x^{n-1} + \ldots + a_2x^2 + a_1x + a_0$.

B. No, f is not a polynomial function because it cannot be written in the form $f(x) = a_n x^n + a_{n-1}x^{n-1} + \ldots + a_2x^2 + a_1x + a_0$.

C. No, f is not a polynomial function because the numerator is not fully factored.

36. Use the Rational Zero Theorem to list all possible rational zeros for the given function.

$$f(x) = x^3 + 4x^2 + 10x + 6$$

Choose the answer below that lists all possible rational zeros.

A. $-1, 1, -2, 2, -3, 3, -6, 6$

B. $-1, 1, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{3}, \frac{1}{3}, -\frac{1}{6}, \frac{1}{6}$

C. $-1, 1, -6, 6$

D. $-1, 1, -2, 2, -3, 3, -6, 6, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{3}, \frac{1}{3}, -\frac{1}{6}, \frac{1}{6}$

37. Use the Rational Zero Theorem to list all possible rational zeros for the given function.

$$f(x) = 3x^4 - 10x^3 + 19x^2 - 7x - 6$$

Choose the answer below that lists all possible rational zeros.

A. $-1, 1, -2, 2, -3, 3, -6, 6, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{6}, \frac{1}{6}, -\frac{1}{3}, \frac{1}{3}, -\frac{2}{3}, \frac{2}{3}, -\frac{3}{2}, \frac{3}{2}$

B. $-1, 1, -2, 2, -3, 3, -6, 6, -\frac{1}{3}, \frac{1}{3}, -\frac{2}{3}, \frac{2}{3}$

C. $-1, 1, -3, 3, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{6}, \frac{1}{6}, -\frac{1}{3}, \frac{1}{3}, -\frac{3}{2}, \frac{3}{2}$

D. $-1, 1, -2, 2, -3, 3, -6, 6, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{3}, \frac{1}{3}, -\frac{1}{6}, \frac{1}{6}$

38. The following function is given.

$$f(x) = x^3 - 5x^2 - 4x + 20$$

a. List all possible rational zeros.

☐

(Use a comma to separate answers as needed.)

b. Use synthetic division to test several possible rational roots in order to identify one actual root.

One root of the given function is $x =$ ☐.

c. Use the zero from part **(b)** to find all the zeros of the polynomial function.

The solution set of $f(x) = x^3 - 5x^2 - 4x + 20$ is {☐}.
(Type exact answers, using radicals as needed. Use a comma to separate answers as needed.)

39. The following function is given.

$$f(x) = 3x^3 - 7x^2 - 75x + 175$$

a. Find the list of all possible rational zeros. Choose the correct answer below.

○A. $\pm 1, \pm 5, \pm 25, \pm 7, \pm 35, \pm 175, \pm \frac{1}{3}, \pm \frac{5}{3}, \pm \frac{25}{3}, \pm \frac{7}{3}, \pm \frac{35}{3}, \pm \frac{175}{3}$

○B. $\pm 1, \pm 3, \pm \frac{1}{5}, \pm \frac{3}{5}, \pm \frac{1}{10}, \pm \frac{3}{10}, \pm \frac{1}{7}, \pm \frac{3}{7}, \pm \frac{1}{35}, \pm \frac{3}{35}, \pm \frac{1}{175}, \pm \frac{3}{175}$

○C. $\pm 1, \pm 5, \pm 10, \pm 7, \pm 35, \pm 175, \pm \frac{1}{3}, \pm \frac{5}{3}, \pm \frac{10}{3}, \pm \frac{7}{3}, \pm \frac{35}{3}, \pm \frac{175}{3}$

○D. $\pm 1, \pm 3, \pm \frac{1}{5}, \pm \frac{3}{5}, \pm \frac{1}{25}, \pm \frac{3}{25}, \pm \frac{1}{7}, \pm \frac{3}{7}, \pm \frac{1}{35}, \pm \frac{3}{35}, \pm \frac{1}{175}, \pm \frac{3}{175}$

b. Use synthetic division to test several possible rational roots in order to identify one actual root.

One root of the given function is $x =$ ☐.

c. Use the zero from part **(b)** to find all the zeros of the polynomial function.

The solution set of $f(x) = 3x^3 - 7x^2 - 75x + 175$ is {☐}.
(Type exact answers, using radicals as needed. Use a comma to separate answers as needed.)

40. The following equation is given.

$$x^3 - 5x^2 - 4x + 20 = 0$$

a. List all possible rational roots.

☐

(Use a comma to separate answers as needed.)

b. Use synthetic division to test several possible rational roots in order to identify one actual root.

One root of the given equation is $x =$ ☐.

c. Use the root from part (**b.**) and solve the equation.

The solution set of $x^3 - 5x^2 - 4x + 20 = 0$ is {☐}.
(Type exact answers, using radicals as needed. Use a comma to separate answers as needed.)

41. Answer the following questions about the equation below.

$$x^3 - 34x + 12 = 0$$

(a) List all possible rational roots of the equation.

- A. ± 1
- B. 1,2,3,4,6,12
- C. ± 12
- D. $\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$

(b) Use synthetic division to test several possible rational roots in order to identify one actual root.

One root of the given equation is $x =$ ☐. (Simplify your answer.)

(c) Use the root from part (b) to solve the equation.

The solution set is {☐}.
(Simplify your answer. Use a comma to separate answers as needed.)

42. Find an nth-degree polynomial function with real coefficients satisfying the given conditions. If you are using a graphing utility, use it to graph the function and verify the real zeros and the given function value.

$n = 3$; 4 and $2i$ are zeros; $f(2) = 16$

$f(x) =$ ☐
(Type a polynomial in standard form.)

43. Find an nth-degree polynomial function with real coefficients satisfying the given conditions. If you are using a graphing utility, use it to graph the function and verify the real zeros and the given function value.

$n = 3$; -4 and $6 + 4i$ are zeros; $f(1) = 205$

$f(x) =$ ☐
(Type a polynomial in standard form.)

44. Find an nth-degree polynomial function with real coefficients satisfying the given conditions.

$n = 4$; $2i$ and $5i$ are zeros; $f(-1) = 130$

$f(x) =$ ☐

45. Use Descartes' Rule of Signs to determine the possible numbers of positive and negative real zeros of $f(x) = x^3 + 8x^2 + 5x + 6$.

What are the possible numbers of positive real zeros?

☐ (Use a comma to separate answers as needed.)

What are the possible numbers of negative real zeros?

☐ (Use a comma to separate answers as needed.)

46. Use Descartes's Rule of Signs to determine the possible numbers of positive and negative real zeros of $f(x) = -3x^3 + 2x^2 - 3x + 8$.

What is the possible number of positive real zeros?

☐ (Use a comma to separate answers as needed.)

What is the possible number of negative real zeros?

☐ (Use a comma to separate answers as needed.)

47. Find all the zeros of the polynomial function. Use the Rational Zero Theorem, Descartes's Rule of Signs, and possibly the graph of the polynomial function shown by a graphing utility as an aid in obtaining the first root.

$$f(x) = x^3 - 5x^2 - 17x + 21$$

The zeros of the function are $\{\square\}$.
(Use a comma to separate your answers as needed.)

48. Solve the given polynomial equation. Use the Rational Zero Theorem and Descartes's Rule of Signs as an aid in obtaining the first root.

$$4x^3 - 27x^2 - 11x - 1 = 0$$

The solution set is $\{\square\}$.
(Use commas to separate answers. Type integers or fractions. Type exact answers using radicals as needed.)

49. Use the rational zeros theorem to find all the real zeros of the polynomial function. Use the zeros to factor f over the real numbers.

$$f(x) = x^4 + 6x^3 - 8x^2 - 6x + 7$$

Select the correct choice below and, if necessary, fill in the answer box to complete your answer.

○ A. The set of zeros is $\{\square\}$.
(Simplify your answer. Type an exact answer, using radicals as needed. Use a comma to separate answers as needed.)

○ B. The solution is not a real number.

Use the real zeros to factor f.

$f(x) = \square$
(Simplify your answer. Type your answer in factored form.)