MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the inverse of the one-to-one function.

1) \( f(x) = \frac{5x - 3}{8} \)

A) \( f^{-1}(x) = \frac{8x - 3}{5} \)
B) \( f^{-1}(x) = \frac{8x + 3}{5} \)
C) \( f^{-1}(x) = \frac{8}{5x - 3} \)
D) \( f^{-1}(x) = \frac{8}{5x + 3} \)

Solve the quadratic inequality and graph the solution set on a number line. Express the solution set in interval notation.

2) \((x - 3)(x + 2) > 0\)

A) \((-\infty, -2) \text{ or } (3, \infty)\)
B) \((-2, 3)\)
C) \((-\infty, -3) \text{ or } (2, \infty)\)
D) \((-2, \infty)\)
3) \( x^2 - 2x \geq 8 \)

A) \( (-\infty, -2] \) or \( [4, \infty) \)

B) \( (-\infty, -2] \)

C) \( [4, \infty) \)

D) \( [-2, 4] \)

Solve the rational inequality and graph the solution set on a real number line. Express the solution set in interval notation.

4) \( \frac{x}{x + 2} > 0 \)

A) \( (0, \infty) \)

B) \( (-\infty, -2] \) or \( [0, \infty) \)

C) \( (-\infty, -2) \) or \( (0, \infty) \)

D) \( (-2, 0] \)
5) \( \frac{x - 8}{x + 5} > 0 \)

A) \((-5, 8)\)

B) \((-\infty, -5)\) or \((8, \infty)\)

C) \((-\infty, -5)\)

D) \((8, \infty)\)

Find the inverse of the one-to-one function.

6) \( f(x) = \frac{5}{3x - 8} \)

A) \( f^{-1}(x) = -\frac{8}{3} - \frac{5}{3}x \)

B) \( f^{-1}(x) = \frac{5}{3y} + \frac{8}{3} \)

C) \( f^{-1}(x) = \frac{5}{3}x + \frac{8}{3} \)

D) \( f^{-1}(x) = \frac{3x - 8}{5} \)

Solve the problem.

7) The cost in millions of dollars for a company to manufacture \(x\) thousand automobiles is given by the function \(C(x) = 3x^2 - 18x + 63\). Find the number of automobiles that must be produced to minimize the cost.

A) 36 thousand automobiles

B) 6 thousand automobiles

C) 3 thousand automobiles

D) 9 thousand automobiles

8) A farmer has 64 feet of fencing which he plans to use to fence in a plot of land for a pig pen. If he chooses to enclose a plot along the broad side of his barn, what is the largest area that can be enclosed? (Note: The side along the barn will not require fencing.)

A) length: 48 feet, width: 16 feet

B) length: 16 feet, width: 16 feet

C) length: 32 feet, width: 32 feet

D) length: 32 feet, width: 16 feet
Use the Leading Coefficient Test to determine the end behavior of the polynomial function.

9) \( f(x) = 3x^4 - 2x^3 + 5x^2 + 3x + 4 \)
   - A) rises to the left and rises to the right
   - B) rises to the left and falls to the right
   - C) falls to the left and falls to the right
   - D) falls to the left and rises to the right

10) \( f(x) = 4x^3 - 2x^2 - 5x + 4 \)
    - A) falls to the left and rises to the right
    - B) rises to the left and rises to the right
    - C) rises to the left and falls to the right
    - D) falls to the left and falls to the right

11) \( f(x) = -3x^3 - 3x^2 - 4x + 5 \)
    - A) rises to the left and falls to the right
    - B) rises to the left and rises to the right
    - C) falls to the left and rises to the right
    - D) falls to the left and falls to the right

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 at each zero.

12) \( f(x) = (x + \frac{1}{5})^4 (x^2 + 7)^4 \)
    - A) \( x = -\frac{1}{5} \) has multiplicity 4; The graph touches the x-axis and turns around.
    - B) \( x = -\frac{1}{5} \) has multiplicity 4; The graph crosses the x-axis.
    - C) \( x = \frac{1}{5} \) has multiplicity 4; The graph touches the x-axis and turns around; \( x = 7 \) has multiplicity 4; The graph crosses the x-axis.
    - D) \( x = -\frac{1}{5} \) has multiplicity 4; The graph touches the x-axis and turns around; \( x = -7 \) has multiplicity 4; The graph crosses the x-axis.

13) \( f(x) = (x + \frac{1}{5})^2 (x - 6)^3 \)
    - A) \( x = \frac{1}{5} \) has multiplicity 2; The graph touches the x-axis and turns around; \( x = -6 \) has multiplicity 3; The graph crosses the x-axis.
    - B) \( x = -\frac{1}{5} \) has multiplicity 2; The graph touches the x-axis and turns around; \( x = 6 \) has multiplicity 3; The graph crosses the x-axis.
    - C) \( x = -\frac{1}{5} \) has multiplicity 2; The graph crosses the x-axis; \( x = 6 \) has multiplicity 3; The graph touches the x-axis and turns around.
    - D) \( x = \frac{1}{5} \) has multiplicity 2; The graph crosses the x-axis; \( x = -6 \) has multiplicity 3; The graph touches the x-axis and turns around.
Graph the polynomial function.

14) \( f(x) = x(x - 1)(x + 2) \)
15) \( f(x) = x^4 + 2x^3 - x^2 - 2 \)

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Divide using long division.

16) \( \frac{-16x^3 - 16x^2 + 9x + 18}{4x + 1} \)

A) \( x^2 + 3 + \frac{-3}{4x + 1} \)

B) \( -4x^2 - 3x + 3 + \frac{18}{4x + 1} \)

C) \( -4x^2 - 3x + 3 + \frac{15}{4x + 1} \)

D) \( -4x^2 - 3x + 3 \)
17) \( \frac{x^4 + 4x^3 + 2x^2 + 7x - 60}{x^2 + 3x - 5} \)

A) \( x^2 + 6x + 15 \)  
B) \( x^2 + 6x + 15 + \frac{10x - 55}{x^2 + 3x - 5} \)  
C) \( x^2 + x + 4 + \frac{-40}{x^2 + 3x - 5} \)  
D) \( x^2 + x + 4 \)

Divide using synthetic division.

18) \( \frac{-5x^3 - 6x^2 + 9x + 2}{x + 2} \)

A) \( 5x^2 - 2x + 1 \)  
B) \( -\frac{5}{2}x^2 - 3x + \frac{9}{2} \)  
C) \( -5x^2 + 4x + 1 \)  
D) \( -5x^2 - x - 3 + 1 \)

19) \( \frac{x^5 + x^3 + 5}{x - 2} \)

A) \( x^4 + 3x^2 + \frac{11}{x - 2} \)  
B) \( x^4 + 2x^3 + 5x^2 + 10x + 20 + \frac{45}{x - 2} \)  
C) \( x^4 + 3 + \frac{11}{x - 2} \)  
D) \( x^4 + 2x^3 + 4x^2 + 9x + 18 + \frac{41}{x - 2} \)

Solve the problem.

20) Solve the equation \( 3x^3 - 28x^2 + 51x - 14 = 0 \) given that \( 2 \) is a zero of \( f(x) = 3x^3 - 28x^2 + 51x - 14 \).

A) \( \{2, -1, \frac{1}{3}\} \)  
B) \( \{2, -1, \frac{7}{3}\} \)  
C) \( \{2, 1, \frac{1}{3}\} \)  
D) \( \{2, 1, -\frac{7}{3}\} \)

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

21) \( f(x) = 6x^4 + 4x^3 - 2x^2 + 2 \)

A) \( \pm \frac{1}{6}, \pm \frac{1}{3}, \pm \frac{1}{2}, \pm 1, \pm 2 \)  
B) \( \pm \frac{1}{2}, \pm \frac{3}{2}, \pm 1, \pm 2, \pm 3, \pm 6 \)  
C) \( \pm \frac{1}{6}, \pm \frac{1}{3}, \pm \frac{1}{2}, \pm 1, \pm 2, \pm 3 \)  
D) \( \pm \frac{1}{6}, \pm \frac{1}{3}, \pm \frac{1}{2}, \pm \frac{2}{3}, \pm 1, \pm 2 \)

22) \( f(x) = 5x^3 - x^2 + 3 \)

A) \( \pm \frac{1}{5}, \pm \frac{3}{5}, \pm 1, \pm 3, \pm 5 \)  
B) \( \pm \frac{1}{5}, \pm \frac{1}{3}, \pm 1, \pm 3, \pm 5 \)  
C) \( \frac{1}{5}, \pm \frac{3}{5}, \pm 1, \pm 3 \)  
D) \( \pm \frac{1}{3}, \pm \frac{5}{3}, \pm 1, \pm 5 \)

List all possible rational roots, use synthetic division to find an actual root, then use this root to solve the equation.

23) \( x^3 - 6x^2 + 7x + 2 = 0 \)

A) \( \{1, -1, -2\} \)  
B) \( \{-2, 4 + \sqrt{5}, 4 - \sqrt{5}\} \)  
C) \( \{2, 4 + \sqrt{2}, 4 - \sqrt{2}\} \)  
D) \( \{2, 2 + \sqrt{5}, 2 - \sqrt{5}\} \)
Find the horizontal asymptote, if any, of the graph of the rational function.

24) \( f(x) = \frac{-2x + 7}{4x - 3} \)

A) \( y = -\frac{1}{2} \)  
B) \( y = -2 \)  
C) \( y = -\frac{7}{3} \)  
D) no horizontal asymptote

25) \( f(x) = \frac{20x}{5x^2 + 1} \)

A) \( y = 4 \)  
B) \( y = 4x \)  
C) \( y = 0 \)  
D) \( y = \frac{1}{4} \)

Graph the rational function.

26) \( f(x) = \frac{3x}{(x - 5)(x + 5)} \)
27) \( f(x) = \frac{1 - 3x}{x} \)
Find the slant asymptote, if any, of the graph of the rational function.
28) \( f(x) = \frac{x^2 - 5x + 9}{x + 9} \)
   A) \( y = x - 14 \)   B) \( x = y + 5 \)
   C) \( y = x + 14 \)   D) no slant asymptote
29) \( f(x) = \frac{x^2 + 6x - 5}{x - 6} \)
   A) \( y = x - 0 \)   B) \( x = y + 12 \)
   C) \( y = x + 12 \)   D) no slant asymptote

Determine the constant of variation for the stated condition.
30) \( g \) varies directly as \( f \), and \( g = 70 \) when \( f = 5 \).
   A) \( k = \frac{1}{14} \)   B) \( k = 16 \)   C) \( k = 14 \)   D) \( k = 65 \)

Solve the problem.
31) \( x \) varies inversely as \( y^2 \), and \( x = 5 \) when \( y = 12 \). Find \( x \) when \( y = 3 \).
   A) \( x = 4 \)   B) \( x = 45 \)   C) \( x = 80 \)   D) \( x = 100 \)

Use the compound interest formulas \( A = P \left(1 + \frac{r}{n}\right)^{nt} \) and \( A = Pe^{rt} \) to solve.
32) Find the accumulated value of an investment of \$19,000 at 6% compounded annually for 12 years.
   A) \$31,540.00   B) \$38,231.73   C) \$32,680.00   D) \$36,067.67
33) Find the accumulated value of an investment of \$2000 at 8% compounded continuously for 3 years.
   A) \$2642.50   B) \$2519.42   C) \$2542.50   D) \$2480.00
34) Find the accumulated value of an investment of \$1500 at 14% compounded quarterly for 2 years.
   A) \$1975.21   B) \$1920.00   C) \$1606.84   D) \$1949.40
The graph of an exponential function is given. Select the function for the graph from the functions listed.

35)

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

Graph the function.

36) Use the graph of $f(x) = 5^x$ to obtain the graph of $g(x) = 5(x - 4)$.
37) Use the graph of \( f(x) = 2^x \) to obtain the graph of \( g(x) = 2(x - 1) + 1 \). 

![Graph of \( f(x) = 2^x \)](image1)

![Graph of \( g(x) = 2(x - 1) + 1 \)](image2)

Solve the problem.

38) The size of the raccoon population at a national park increases at the rate of 4.5% per year. If the size of the current population is 133, find how many raccoons there should be in 5 years. Use the function \( f(x) = 5e^{0.045t} \) and round to the nearest whole number.

A) 169  
B) 167  
C) 165  
D) 171 

39) The population in a particular country is growing at the rate of 2.5% per year. If 7,638,000 people lived there in 1999, how many will there be in the year 2005? Use \( f(x) = y_0e^{0.025t} \) and round to the nearest ten-thousand.

A) 8,700,000  
B) 9,760,000  
C) 8,870,000  
D) 10,650,000
Find the coordinates of the vertex for the parabola defined by the given quadratic function.

40) \( f(x) = (x + 8)^2 - 4 \)
   A) (8, -4)    B) (8, 4)    C) (-8, -4)    D) (-8, 4)

41) \( f(x) = x^2 + 14x + 3 \)
   A) (-7, -144)  B) (14, 395)  C) (7, 150)  D) (-7, -46)

42) \( f(x) = -x^2 + 12x - 7 \)
   A) (12, -7)    B) (6, 29)    C) (-6, -115)  D) (-6, -43)

43) \( f(x) = -6x^2 + 12x + 5 \)
   A) (2, -7)    B) (-2, -43)    C) (1, 11)  D) (-1, -13)

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 at each zero.

44) \( f(x) = 3(x^2 + 3)(x - 6)^2 \)
   A) \( x = 6 \) has multiplicity 2; The graph crosses the x-axis.
   B) \( x = -3 \) has multiplicity 1; The graph crosses the x-axis; \( x = 6 \) has multiplicity 2; The graph touches the x-axis and turns around.
   C) \( x = -3 \) has multiplicity 1; The graph touches the x-axis and turns around. \( x = 6 \) has multiplicity 2; The graph crosses the x-axis.
   D) \( x = 6 \) has multiplicity 2; The graph touches the x-axis and turns around.

45) \( f(x) = \left( x + \frac{1}{3} \right)^4 (x - 4)^5 \)
   A) \( x = -\frac{1}{3} \) has multiplicity 4; The graph crosses the x-axis; \( x = 4 \) has multiplicity 5; The graph touches the x-axis and turns around.
   B) \( x = \frac{1}{3} \) has multiplicity 4; The graph crosses the x-axis and turns around; \( x = -4 \) has multiplicity 5; The graph crosses the x-axis.
   C) \( x = -\frac{1}{3} \) has multiplicity 4; The graph crosses the x-axis and turns around; \( x = 4 \) has multiplicity 5; The graph crosses the x-axis.
   D) \( x = \frac{1}{3} \) has multiplicity 4; The graph crosses the x-axis; \( x = -4 \) has multiplicity 5; The graph touches the x-axis and turns around.
46) \( f(x) = (x + \frac{1}{3})^2 (x^2 + 8)^5 \)

A) \( x = \frac{1}{3} \) has multiplicity 2; The graph touches the x-axis and turns around; \( x = 8 \) has multiplicity 5; The graph crosses the x-axis.

B) \( x = -\frac{1}{3} \) has multiplicity 2; The graph touches the x-axis and turns around.

C) \( x = -\frac{1}{3} \) has multiplicity 2; The graph crosses the x-axis.

D) \( x = -\frac{1}{3} \) has multiplicity 2; The graph touches the x-axis and turns around; \( x = -8 \) has multiplicity 5; The graph crosses the x-axis.

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.

47) \( f(x) = -4x^3 - 3x^2 + 2x - 2 \)

A) rises to the left and falls to the right

B) falls to the left and rises to the right

C) rises to the left and rises to the right

D) falls to the left and falls to the right

48) \( f(x) = 5x^4 + 2x^3 + 5x^2 + 5x + 3 \)

A) rises to the left and falls to the right

B) falls to the left and rises to the right

C) rises to the left and rises to the right

D) falls to the left and falls to the right

49) \( f(x) = -3x^4 - 2x^3 - 5x^2 + 2x + 2 \)

A) rises to the left and rises to the right

B) falls to the left and falls to the right

C) rises to the left and falls to the right

D) falls to the left and rises to the right
50) \( f(x) = 5x^3 - 3x^2 - 4x - 4 \)
   A) falls to the left and falls to the right  
   B) rises to the left and rises to the right  
   C) rises to the left and falls to the right  
   D) falls to the left and rises to the right

**Find the zeros of the polynomial function.**

51) \( f(x) = x^3 + x^2 - 42x \)
   A) \( x = 0, x = -7, x = 6 \)  
   B) \( x = -7, x = 6 \)  
   C) \( x = 0, x = 5, x = 6 \)  
   D) \( x = 5, x = 6 \)

52) \( f(x) = x^3 + 6x^2 - x - 6 \)
   A) \( x = 36 \)  
   B) \( x = 1, x = -6, x = 6 \)  
   C) \( x = -1, x = 1, x = -6 \)  
   D) \( x = -6, x = 6 \)

53) \( f(x) = 4(x + 5)(x - 1)^2 \)
   A) \( x = 5, x = -1, x = 2 \)  
   B) \( x = -5, x = 1, \)  
   C) \( x = -5, x = 2 \)  
   D) \( x = 5, x = 2 \)

**Find the horizontal asymptote, if any, of the graph of the rational function.**

54) \( f(x) = \frac{-5x - 3}{2x + 7} \)
   A) \( y = -\frac{3}{7} \)  
   B) \( y = -\frac{5}{2} \)  
   C) \( y = -5 \)  
   D) no horizontal asymptote

55) \( f(x) = \frac{9x}{3x^2 + 1} \)
   A) \( y = 3 \)  
   B) \( y = \frac{1}{3} \)  
   C) \( y = 0 \)  
   D) \( y = 3x \)

**Graph the rational function.**

56) \( f(x) = \frac{x^2 + 2x}{(x - 4)^2} \)
Answer Key
Testname: 06T3P.TST

1) B
2) A
3) A
4) C
5) B
6) C
7) C
8) D
9) A
10) A
11) A
12) A
13) B
14) C
15) C
16) C
17) C
18) C
19) B
20) C
21) D
22) C
23) D
24) A
25) C
26) D
27) D
28) A
29) C
30) C
31) C
32) B
33) C
34) A
35) C
36) A
37) C
38) B
39) C
40) C
41) D
42) B
43) C
44) D
45) C
46) B
47) D
48) C
49) B
50) D
Answer Key
Testname: 06T3P.TST

51) A
52) C
53) B
54) B
55) C
56) C