

Houston Community College System
Department of Mathematics
MATH 1314-College Algebra
Final Exam Review

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Solve the equation by using the square root property.

1) $\left(t - \frac{1}{6}\right)^2 = -\frac{17}{36}$ 1) _____

Solve the equation by using the quadratic formula.

2) $(3x - 2)(x - 1) = -3$ 2) _____

Find the value of n so that the expression is a perfect square trinomial and then factor the trinomial.

3) Find the value of n so that the expression is a perfect square trinomial and then factor the trinomial. 3) _____

$$t^2 - \frac{14}{3}t + n$$

Solve for the indicated variable.

4) $at^2 + uy = h$ for t 4) _____

Solve the problem.

5) The length of the longer leg of a right triangle is 14 ft longer than the length of the shorter leg x . The hypotenuse is 6 ft longer than twice the length of the shorter leg. Find the dimensions of the triangle. 5) _____

Solve the following equations by the most convenient method. Please show all work.

6) $\frac{5}{x-4} - \frac{8}{x+1} = \frac{34}{x^2 - 3x - 4}$ 6) _____

7) $5 - \sqrt{x+10} = \sqrt{7-x}$ 7) _____

8) $4x^{2/3} - 9x^{1/3} = 9$ 8) _____

9) $(x-1)^4 - 5(x-1)^2 + 4 = 0$ 9) _____

Solve the equation, then find S the sum of the solutions:

10) $|5x + 4| = |x + 9|$ 10) _____

Solve the following inequalities by the most convenient method. Please show all work. Write the solution set in interval notation.

11) $x^3 + 4x^2 - 9x - 36 \geq 0$

11) _____

12) $24 \leq 2 + |-15t + 1|$

12) _____

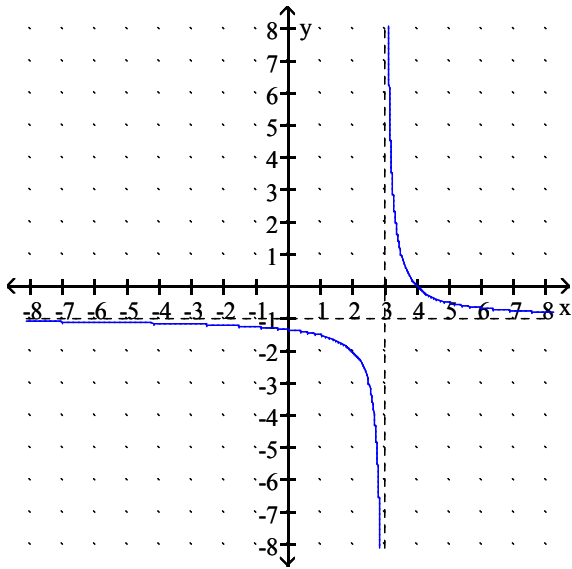
13) $\frac{40 - 8x}{x^2} \leq 0$

13) _____

The graph of $y = f(x)$ is given. Solve the inequality.

14) $f(x) > 0$

14) _____



Write the given equation in the form $(x - h)^2 + (y - k)^2 = r^2$. Identify the center and radius.

15) $2x^2 + 2y^2 + 16x - 20y + 50 = 0$

15) _____

16) The endpoints of the diameter of a circle are $(-2,3)$ and $(-10,9)$. Write an equation of this circle in standard form and identify its center and radius.

16) _____

Find an equation for the line, in the indicated form, with the given properties.

17) Containing the points $(8, -2)$ and $(-5, 7)$; general form

17) _____

Given the equation $12x = 8 - 5y$.

- 18) a) Write the equation in slope-intercept form
- b) Determine the slope and the y-intercept.
- c) What is the x-intercept
- d) Graph the line

18) _____

Find an equation for the line with the given properties.

- 19) Perpendicular to the line $x - 5y = 3$; containing the point $(5, 3)$

19) _____

Determine whether the equation defines y as a function of x .

20) $y = \pm\sqrt{1 - 5x}$

20) _____

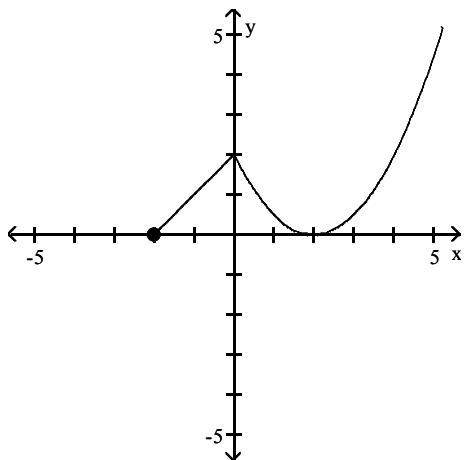
21) $y = \frac{5x - 1}{x + 1}$

21) _____

Determine whether the graph is that of a function. If it is, use the graph to find its domain and range, the intercepts, if any, and any symmetry with respect to the x -axis, the y -axis, or the origin.

22)

22) _____



Solve the problem.

23) If $f(x) = \frac{x - B}{x - A}$, $f(4) = 0$, and $f(6)$ is undefined, what are the values of A and B ?

23) _____

Evaluate the function for the indicated value, then simplify.

24) $f(t) = t^2 + 5t$; find $f(t - 5)$, then simplify as much as possible.

24) _____

Find $\frac{f(x + h) - f(x)}{h}$ for the given function.

25) $f(x) = x^2 + 8x$.

25) _____

Graph the function.

$$26) f(x) = \begin{cases} -x + 3 & \text{for } x \leq 3 \\ \sqrt{x-3} & \text{for } x > 3 \end{cases}$$

26) _____

Given

27)

$$f(x) = \begin{cases} -5x + 4, & \text{for } x < -1 \\ x^2 + 3, & \text{for } -1 \leq x < 2 \\ 1, & \text{for } x \geq 2 \end{cases}$$

27) _____

Evaluate $f(-1) - f(5)$

Find the domain of the following functions, then write it in interval notation

$$28) \frac{x}{\sqrt{x-6}}$$

28) _____

$$29) g(t) = \sqrt[3]{5-t}$$

29) _____

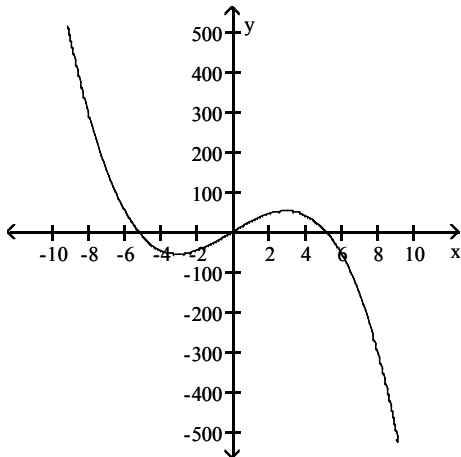
$$30) m(x) = \frac{5}{|x|+1}$$

30) _____

Use the given graph of $f(x)$ to find the intervals on which the function is increasing or decreasing.

31)

31) _____



Find the indicated function and write its domain in interval notation.

$$32) s(x) = \frac{x-5}{x^2-49}, \quad t(x) = \frac{x-7}{5-x}, \quad (s \cdot t)(x) = ?$$

32) _____

Evaluate the function for the given value of x .

$$33) f(x) = -2x, \quad g(x) = |x+2|, \quad \left(\frac{f}{g}\right)(-5) = ?$$

33) _____

Find the indicated function and write its domain in interval notation.

34) $f(x) = \frac{9}{x^2 - 11}$, $g(x) = \sqrt{4 - x}$, $(f \circ g)(x) = ?$ 34) _____

Use transformations to graph the given function.

35) $f(x) = \sqrt{-x - 4}$ 35) _____

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

A function g is given. Identify the parent function. Then use the steps for graphing multiple transformations of functions to list, in order, the transformations applied to the parent function to obtain the graph of g .

36) $g(x) = \frac{4}{x + 5} - 3$ 36) _____

- A) Parent function: $f(x) = \frac{1}{x}$; Shift the graph of f to the right 5 units, stretch the graph vertically by a factor of 4, and shift the graph upward by 3 units.
- B) Parent function: $f(x) = \frac{1}{x}$; Shift the graph of f to the left 5 units, shrink the graph vertically by a factor of $\frac{1}{4}$, and shift the graph downward by 3 units.
- C) Parent function: $f(x) = \frac{1}{x}$; Shift the graph of f to the right 5 units, shrink the graph vertically by a factor of $\frac{1}{4}$, and shift the graph upward by 3 units.
- D) Parent function: $f(x) = \frac{1}{x}$; Shift the graph of f to the left 5 units, stretch the graph vertically by a factor of 4, and shift the graph downward by 3 units.

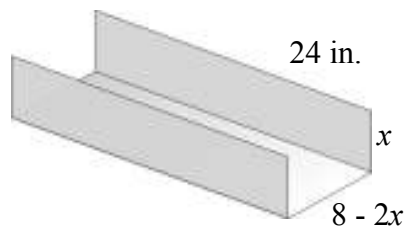
SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Write the function in the vertex form, then find the axis of symmetry, the intercepts of the graph the function, the domain and the range of the function.

37) $f(x) = -3x^2 + 18x - 33$ 37) _____

Solve the problem.

- 38) A trough at the end of a gutter spout is meant to direct water away from a house. 38) _____
The homeowner makes the trough from a rectangular piece of aluminum that is 24 in. long and 8 in. wide. He makes a fold along the two long sides a distance of x inches from the edge.



- Write a function to represent the volume in terms of x .
- What value of x will maximize the volume of water that can be carried by the gutter?

Analyze the graph of the given function f as follows:

- Determine the end behavior of the graph of the function.
- Find the x - and y -intercepts of the graph.
- Determine whether the graph crosses or touches the x -axis at each x -intercept.
- Use the graph to determine the local maxima and local minima, if any exist. Round turning points to two decimal places.
- Use the information obtained in (a) - (d) to draw a complete graph of f by hand. Label all intercepts and turning points.
- Find the domain of f . Use the graph to find the range of f .
- Use the graph to determine where f is increasing and where f is decreasing.

39) $f(x) = x^4 - 8x^2 + 16$ 39) _____

Form a polynomial $f(x)$ with real coefficients having the given degree and zeros.

40) Degree: 4; zeros: $-1, 2,$ and $1 - 2i$. 40) _____

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.

41) $f(x) = 4x^3 - 11x^2 - 6x + 9$ 41) _____

List the potential rational zeros of the polynomial function. Do not find the zeros.

42) $f(x) = 6x^4 + 3x^3 - 2x^2 + 2$ 42) _____

Solve the problem.

43) Find m so that $x + 4$ is a factor of $5x^3 + 18x^2 + mx + 16$ 43) _____

Find the sum of all the zeros of the polynomial.

44) $f(x) = 3x^3 - x^2 - 18x + 6$ 44) _____

Find all asymptotes, if any, of the function.

45) $f(x) = \frac{x^2 + 9x + 6}{x + 5}$ 45) _____

Write the domain in interval notation and identify any vertical asymptotes.

46) $f(x) = \frac{x^2 + x - 56}{x - 7}$ 46) _____

Graph the function.

47) $f(x) = \frac{-4x^2}{x^2 + 4}$ 47) _____

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

Determine which of the rational functions given below has the following feature(s).

48) x-intercepts: (4, 0) and (-3, 0), y-intercepts: none, vertical asymptotes: $x = 0$ and $x = 1$, horizontal asymptote: $y = 1$ 48) _____

A) $f(x) = \frac{(x - 4)(x + 3)}{x(x - 1)}$

B) $f(x) = \frac{(x + 4)(x - 3)}{x(x + 1)}$

C) $f(x) = \frac{(x + 4)(x - 3)}{(x + 1)}$

D) $f(x) = \frac{(x - 4)(x + 3)}{(x - 1)^2}$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

A one-to-one function is given. Write an expression for the inverse function.

49) $f(x) = 4x^3 - 9$ 49) _____

A one-to-one function is given

50) $f(x) = \sqrt{x + 3}$ 50) _____

a. Graph $f(x)$

b. find then graph $f^{-1}(x)$

c. Write the domain of f^{-1} in interval notation

a. Use transformations to graph the function.

b. Write the domain and range in interval notation.

c. Determine the vertical asymptote.

51) $y = \log_5(x + 3)$ 51) _____

Write as the sum or difference of logarithms and fully simplify, if possible. Assume the variable represents a positive real number.

52) $\log \left(\frac{\sqrt[3]{ab}}{c^5} \right)$ 52) _____

Solve the problem.

53) Use the graph of $y = 3^x$ to graph the function. Write the domain and range in interval notation. 53) _____

$$f(x) = 3^{x+5} + 2$$

Solve the equation.

54) $2 + \log_3(2x + 5) - \log_3 x = 4$. If the reciprocal of the solution is written as a reduced fraction $\frac{n}{m}$ (where n and m are integers whose greatest common factor is 1), what is the value of m . 54) _____

Solve the exponential equation. Express the solution set in term of the natural logarithms.

55) $4e^{(3x+2)} = 2$ 55) _____

Solve the system by using any method. If a system does not have one unique solution, state whether the system is inconsistent or whether the equations are dependent.

56) $5x + y = -5$
 $-15x - 3y = 9$ 56) _____

Solve the nonlinear system . Provide the product of the y-values of the solutions

57) $x - 2y = 3$
 $x^2 - xy = 20$ 57) _____

Solve the problem.

58) $f(x) = 4^x + 4$ and $g(x) = 4^{-x} + 6$.
Find the point of intersection of the graphs of f and g by solving $f(x) = g(x)$. 58) _____

Solve the system of equations using Gauss–Jordan elimination.

59) $x = 5 - y - z$
 $x - y + 3z = 23$
 $2x + y = 9 - z$ 59) _____

Solve for x.

60) $\begin{vmatrix} 5 & 9 \\ -2 & x \end{vmatrix} = 8$ 60) _____

Use the given matrices to compute the given expression.

61) Let $A = \begin{bmatrix} 9 & 8 & -3 \\ 3 & -7 & 5 \\ -1 & -2 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 8 & 1 & 1 \\ -2 & 4 & -2 \\ -5 & -8 & 8 \end{bmatrix}$. Find $-3A + 4B$.

61) _____

Answer Key

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1) $\left\{ \frac{1}{6} \pm \frac{\sqrt{17}}{6}i \right\}$

2) $\left\{ \frac{5}{6} - \frac{\sqrt{35}}{6}i, \frac{5}{6} + \frac{\sqrt{35}}{6}i \right\}$

3) $n = \frac{49}{9}; \left[t - \frac{7}{3} \right]^2$

4) $t = \pm \frac{\sqrt{a(h - uy)}}{a}$

5) Short leg = 10, long leg = 24, hypotenuse = 26

6) {1}

7) {6, -9}

8) $\left\{ -\frac{27}{64}, 27 \right\}$

9) {-1, 0, 2, 3}

10) {-11/12 }

11) [-4, -3] \cup [3, ∞)

12) $\left(-\infty, -\frac{7}{5} \right] \cup \left[\frac{23}{15}, \infty \right)$

13) [5, ∞)

14) (3, 4)

15) $(x + 4)^2 + (y - 5)^2 = 16$

Center: (-4, 5); $r = 4$

16) $x^2 + y^2 + 12x - 12y + 47 = 0$

17) $9x + 13y = 46$

18) $y = -\frac{12}{5}x + \frac{8}{5}$

19) $y = -5x + 28$

20) not a function

21) function

22) function

domain: $\{x \mid x \geq -2\}$

range: $\{y \mid y \geq 0\}$

intercepts: (-2, 0), (0, 2), (2, 0)

symmetry: none

23) A = 6, B = 4

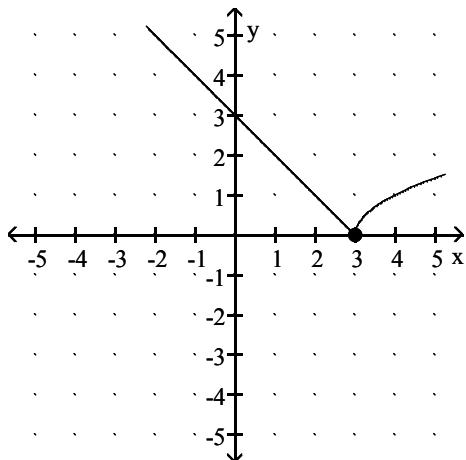
24) $t^2 - 5t$

25) $2x + h + 8$

Answer Key

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26)



27) **3**

28) $(6, \infty)$

29) $(-\infty, \infty)$

30) (∞, ∞)

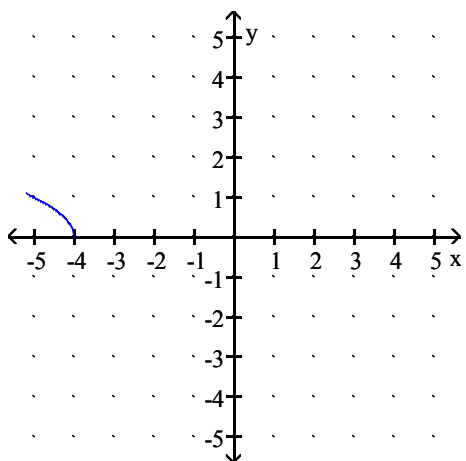
31) The function is increasing on $(-3, 3)$, and it is decreasing on $(-\infty, -3) \cup (3, \infty)$

32) $-\frac{1}{x+7}$; $(-\infty, -7) \cup (-7, 5) \cup (5, 7) \cup (7, \infty)$

33) $\left(\frac{f}{g}\right)(-5) = \frac{10}{3}$

34) $-\frac{9}{x+7}$; $(-\infty, -7) \cup (-7, 4]$

35)



36) D

Answer Key

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

Domain : $(-\infty, \infty)$.

Range: $(-\infty, -6]$

Axis of symmetry : $x = 3$

x - intercept : None

y - intercept : $(0, -33)$

38) **a.** $V(x) = -48x^2 + 192x$; **b.** $x = 2$

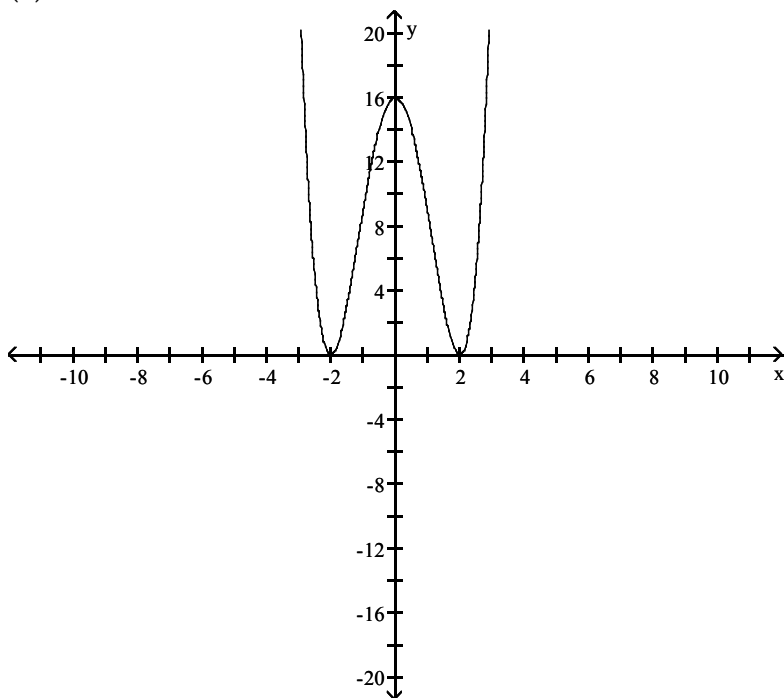
39) (a) As $x \rightarrow -\infty, f(x) \rightarrow \infty$; As $x \rightarrow \infty, f(x) \rightarrow \infty$

(b) y -intercept: $(0, 16)$; x -intercepts: $(-2, 0)$, and $(2, 0)$

(c) The graph of $f(x)$ touches the x -axis at $(-2, 0)$, and at $(2, 0)$, and it bounces without crossing the x -axis.

(d) Local maxima at $(0, 16)$; Local minimum at $(-2, 0)$, and at $(2, 0)$

(e)



(f) Domain of $f(x)$: all real numbers; range of $f(x)$: $[0, \infty)$

(g) f is increasing on $(-2, 0) \cup (2, \infty)$; f is decreasing on $(-\infty, -2) \cup (0, 2)$

40) $f(x) = x^4 - 3x^3 + 5x^2 - x - 10$

41) $-1, \frac{3}{4}, 3$; $f(x) = (4x - 3)(x - 3)(x + 1)$

42) $\pm \frac{1}{6}, \pm \frac{1}{3}, \pm \frac{1}{2}, \pm \frac{2}{3}, \pm 1, \pm 2$

43) $m = -4$

Answer Key

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44) $\{\frac{1}{3}\}$

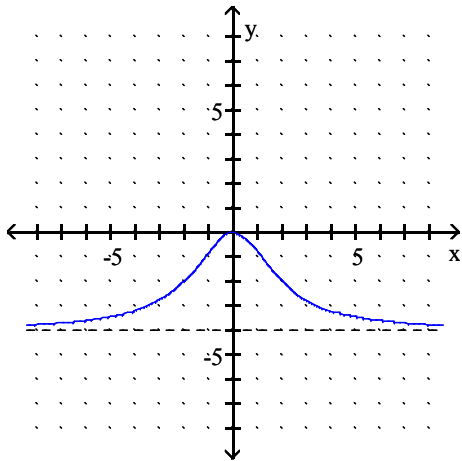
45) Vertical asymptote : $x = - 5$

Horizontal asymptote: none

Oblique (slant) asymptote: $y = x + 4$

46) $(-\infty, 7) \cup (7, \infty)$; None

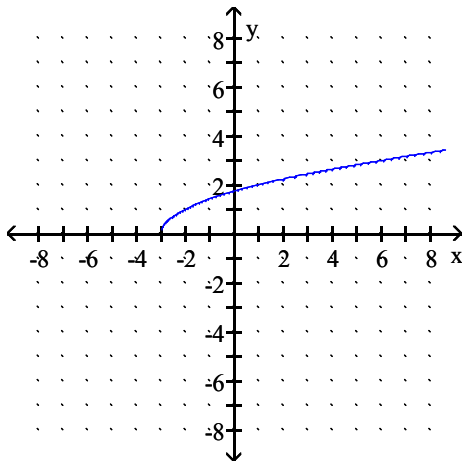
47)



48) A

49) $f^{-1}(x) = \sqrt[3]{\frac{x+9}{4}}$

50) a.



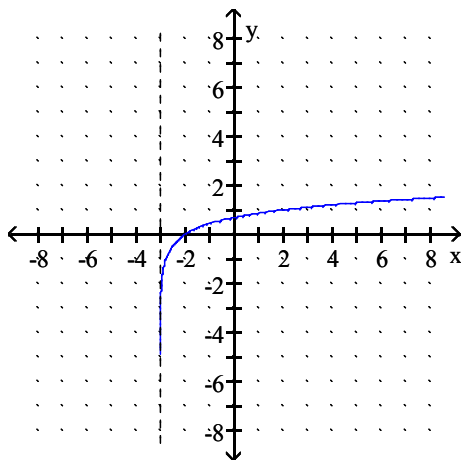
b. $f^{-1}(x) = x^2 - 3; x \geq 0$;

c. $[0, \infty)$

Answer Key

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51) a.

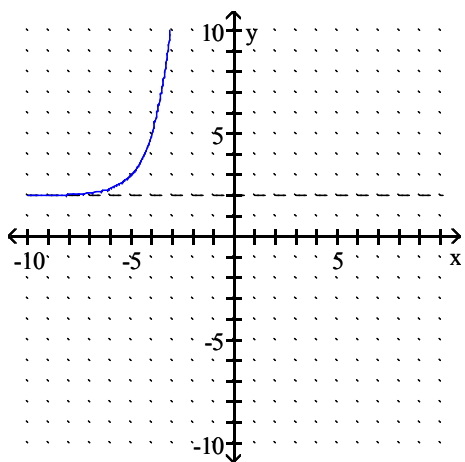


b. domain: $(-3, \infty)$, range $(-\infty, \infty)$

c. vertical asymptote: $x = -3$

52) $\frac{1}{3}\log a + \frac{1}{3}\log b - 5\log c$

53)



Domain: $(-\infty, \infty)$

Range: $(2, \infty)$

54) $\{ 5 \}$

55) $\{-1/3[\ln(2) + 2]\}$

56) $\{ \}$; The system is inconsistent.

57) $\{-\frac{11}{2}\}$

58) $(1, 1024)$

59) $\{(4, -4, 5)\}$

60) -2

61) $\begin{bmatrix} 5 & -20 & 13 \\ -17 & 37 & -23 \\ -17 & -26 & 26 \end{bmatrix}$