Sections 5.1, 5.2, 5.3, 8.1,8.6 & 8.7
Practice for the Exam
MAC 1105 –– Sulivan 8th Ed

Name: _____
Date: _____
Class/Section: _____

State whether the function is a polynomial function or not. If it is, give its degree. If it is not, tell why not.

1) $f(x) = 3x + 4x^2$ 1) _____

A) Yes; degree 4 B) Yes; degree 2 C) Yes; degree 3 D) Yes; degree 1

2) $f(x) = \frac{1 - x^5}{4}$ 2) _____

A) Yes; degree 1
B) No; x is a negative term
C) No; it is a ratio
D) Yes; degree 5

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

A) Yes; degree 5
B) Yes; degree 3/2
C) No; x is raised to non–integer 3/2 power
D) Yes; degree 3

4) $9(x - 1)^{12}(x + 1)^5$ 4) _____

A) Yes; degree 9
B) Yes; degree 17
C) Yes; degree 12
D) Yes; degree 108

For the polynomial, list each real zero and its multiplicity. Determine whether the graph crosses or touches the x –axis at each x –intercept.

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

A) –6, multiplicity 1, touches x–axis; –5, multiplicity 4, crosses x–axis
B) 6, multiplicity 1, touches x–axis; 5, multiplicity 4, crosses x–axis
C) 6, multiplicity 1, crosses x–axis; 5, multiplicity 4, touches x–axis
D) –6, multiplicity 1, crosses x–axis; –5, multiplicity 4, touches x–axis

6) $f(x) = 2(x^2 + 2)(x + 6)^2$ 6) _____

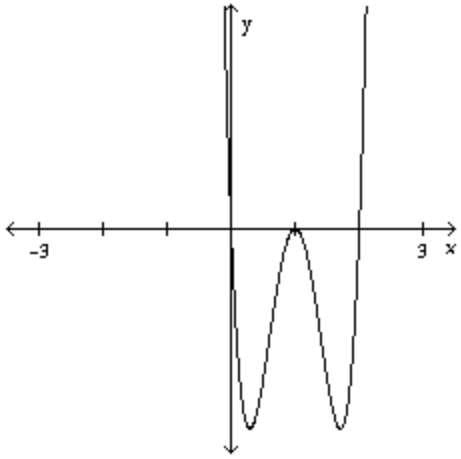
A) –6, multiplicity 2, crosses x–axis
B) –2, multiplicity 1, crosses x–axis; –6, multiplicity 2, touches x–axis
C) –2, multiplicity 1, touches x–axis; –6, multiplicity 2, crosses x–axis
D) –6, multiplicity 2, touches x–axis

7) $f(x) = \frac{1}{4}x^4(x^2 - 3)$ 7) _____

A) 0, multiplicity 4, touches x–axis;
$\sqrt{3}$, multiplicity 1, crosses x–axis;
$-\sqrt{3}$, multiplicity 1, crosses x–axis
B) 0, multiplicity 4, crosses x–axis;
$\sqrt{3}$, multiplicity 1, touches x–axis;
$-\sqrt{3}$, multiplicity 1, touches x–axis
C) 0, multiplicity 4, crosses x–axis
D) 0, multiplicity 4, touches x–axis

Solve the problem.

8) Which of the following polynomial functions might have the graph shown in the illustration below? 8) _____



A) $f(x) = x^2(x - 2)^2(x - 1)^2$
B) $f(x) = x(x - 2)(x - 1)^2$
C) $f(x) = x^2(x - 2)(x - 1)$
D) $f(x) = x(x - 2)^2(x - 1)$

Find the x– and y–intercepts of f.

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

A) x–intercepts: 0, 3, –3; y–intercept: 9
B) x–intercepts: 0, 3, –3; y–intercept: 0
C) x–intercepts: 0, –9; y–intercept: 0
D) x–intercepts: 0, –9; y–intercept: 9

Find the power function that the graph of f resembles for large values of |x|.

10) $f(x) = (x + 7)^5(x + 8)^3$ 10) _____

A) $y = x^8$
B) $y = x^5$
C) $y = x^3$
D) $y = x^{15}$

Determine the maximum number of turning points of f.

11) $f(x) = -x^2(x + 3)^3(x^2 - 1)$ 11) _____

A) 7
B) 5
C) 2
D) 6

Use the x–intercepts to find the intervals on which the graph of f is above and below the x –axis.

12) $f(x) = (x - 4)^2(x + 5)^2$ 12) _____

A) above the x–axis: $(-\infty, -5), (4, \infty)$
below the x–axis: $(-5, 4)$
B) above the x–axis: $(-5, 4)$
below the x–axis: $(-\infty, -5), (4, \infty)$
C) above the x–axis: no intervals
below the x–axis: $(-\infty, -5), (-5, 4), (4, \infty)$
D) above the x–axis: $(-\infty, -5), (-5, 4), (4, \infty)$
below the x–axis: no intervals

Analyze the graph of the given function f as follows:
(a) Determine the end behavior: find the power function that the graph of f resembles for large values of |x|.
(b) Find the x– and y–intercepts of the graph.
(c) Determine whether the graph crosses or touches the x –axis at each x–intercept.
(d) Graph f using a graphing utility.
(e) Use the graph to determine the local maxima and local minima, if any exist. Round turning points to two decimal places.
(f) Use the information obtained in (a) – (e) to draw a complete graph of f by hand. Label all intercepts and turning points.
(g) Find the domain of f. Use the graph to find the range of f.
(h) Use the graph to determine where f is increasing and where f is decreasing.

13) $f(x) = (x + 3)(x - 1)^2$ 13) _____

14) $f(x) = -x^2(x - 1)(x + 3)$ 14) _____

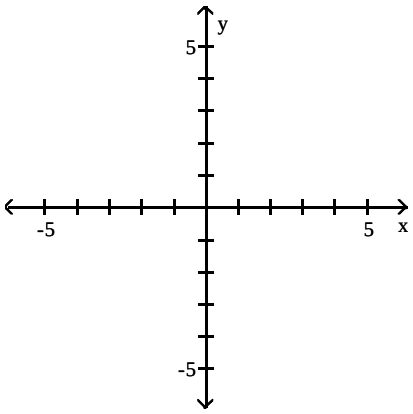
Find the x– and y–intercepts of f.

15) $f(x) = (x + 3)(x - 2)(x + 2)$ 15) _____

A) x–intercepts: –2, 2, 3; y–intercept: –12
B) x–intercepts: –3, –2, 2; y–intercept: –12
C) x–intercepts: –3, –2, 2; y–intercept: 12
D) x–intercepts: –2, 2, 3; y–intercept: 12

Analyze the graph of the given function f as follows:
a) Find the x– and y–intercepts of the graph of f. Round to two decimal places, if necessary.
b) Determine whether the graph crosses or touches the x –axis at each x–intercept.
c) End behavior: find the power function that the graph of f resembles for large values of |x|.
d) Use a graphing utility to graph the function. Approximate the local maxima rounded to two decimal places, if necessary. Approximate the local minima rounded to two decimal places, if necessary.
e) Determine the number of turning points on the graph.
f) Put all the information together, and connect the points with a smooth, continuous curve to obtain the graph of f.

16) $f(x) = (x - 2)^3(x - 3)^2(x - 4)$ 16) _____



Find the domain of the rational function.

17) $R(x) = \dfrac{x + 3}{x^2 - 4}$ 17) _____

A) $\{x \mid x \neq -2, x \neq 2, x \neq -3\}$
B) $\{x \mid x \neq -2, x \neq 2\}$
C) $\{x \mid x \neq 0, x \neq 4\}$
D) all real numbers

18) $G(x) = \dfrac{x}{x^3 - 27}$ 18) _____

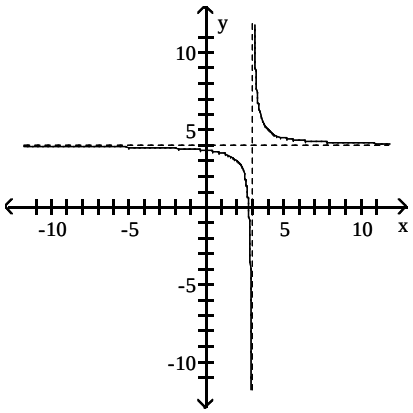
A) $\{x \mid x \neq 9\}$ B) $\{x \mid x \neq -3, 3\}$ C) $\{x \mid x \neq 3\}$ D) $\{x \mid x \neq -3\}$

19) $Q(x) = \dfrac{x + 8}{x^2 + 36x}$ 19) _____

A) $\{x \mid x \neq -6, x \neq 6, x \neq -8\}$
B) $\{x \mid x \neq -6, x \neq 6\}$
C) $\{x \mid x \neq 0, x \neq -36\}$
D) all real numbers

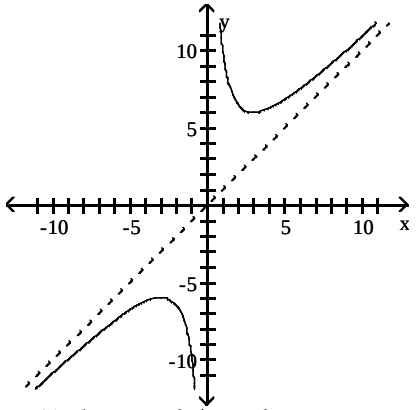
Use the graph to determine the domain and range of the function.

20) 20) _____



A) domain: $\{x \mid x \neq 3\}$
range: $\{y \mid y \neq 4\}$
B) domain: $\{x \mid x \neq 4\}$
range: $\{y \mid y \neq 3\}$
C) domain: $\{x \mid x \neq 4\}$
range: $\{y \mid y \neq -3\}$
D) domain: $\{x \mid x \neq -3\}$
range: $\{y \mid y \neq 4\}$

21) 21) _____



A) domain: $\{x \mid x \neq 0\}$
range: $\{y \mid y \leq -6 \text{ or } y \geq 6\}$
B) domain: $\{x \mid x \leq -6 \text{ or } x \geq 6\}$
range: $\{y \mid y \neq 0\}$
C) domain: all real numbers
range: $\{y \mid y \leq -6 \text{ or } y \geq 6\}$
D) domain: $\{x \mid x \neq 0\}$
range: all real numbers

Find the vertical asymptotes of the rational function.

22) $F(x) = \frac{7x}{x + 9}$ 22) _____

A) $x = -9$ B) $x = 7$ C) $x = 9$ D) none

23) $Q(x) = \frac{x + 7}{x^2 + 1}$ 23) _____

A) $x = -1, x = 1$ B) $x = -1, x = -7$
C) $x = -1, x = 1, x = -7$ D) none

24) $R(x) = \frac{-3x^2}{x^2 + 9x - 22}$ 24) _____

A) $x = -22$ B) $x = -11, x = 2, x = -3$
C) $x = -11, x = 2$ D) $x = 11, x = -2$

Give the equation of the horizontal asymptote, if any, of the function.

25) $G(x) = \frac{x^2 + 4x - 2}{x - 2}$ 25) _____

A) $y = 2$ B) $y = 0$ C) $y = 1$ D) none

26) $F(x) = \frac{4x^2 + 2}{4x^2 - 2}$ 26) _____

A) $y = 1$ B) $y = 4$ C) $y = 2$ D) none

27) $T(x) = \frac{8x^2 - 9x - 4}{3x^2 - 8x + 8}$ 27) _____

A) $y = \frac{9}{8}$ B) $y = \frac{8}{3}$ C) $y = 0$ D) none

28) $G(x) = \frac{x(x - 1)}{x^3 + 25x}$ 28) _____

A) $x = 0, x = -25$ B) $y = 1$ C) $y = 0$ D) none

Find the indicated intercept(s) of the graph of the function.

29) y–intercept of $f(x) = \frac{7}{x^2 - 3x - 23}$ 29) _____

A) $\left(0, \frac{7}{23}\right)$ B) $\left(0, -\frac{7}{23}\right)$ C) (0, 7) D) none

30) y–intercept of $f(x) = \frac{x^2 - 2x + 15}{x^2 + 8x - 5}$ 30) _____

A) (0, 15) B) (0, 8) C) (0, –3) D) none

31) x–intercepts of $f(x) = \dfrac{x - 6}{x^2 + 3x - 3}$ 31) _____

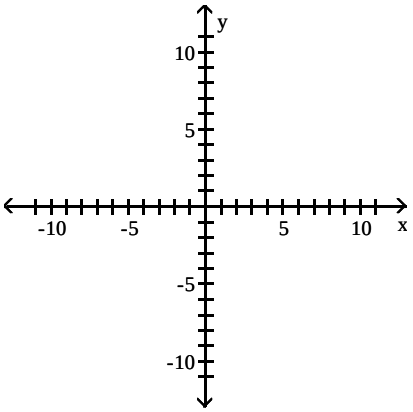
A) (–6, 0) B) (6, 0) C) (3, 0) D) none

32) x–intercepts of $f(x) = \dfrac{(x - 9)(2x + 9)}{x^2 + 2x - 2}$ 32) _____

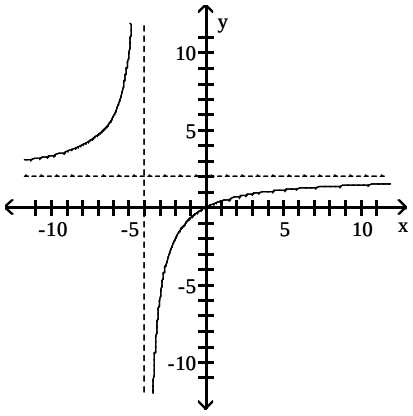
A) $(-9, 0), \left(\dfrac{9}{2}, 0\right)$ B) $(9, 0), \left(-\dfrac{9}{2}, 0\right)$ C) (9, 0), (–9, 0) D) none

Graph the function.

33) $f(x) = \dfrac{2x}{x - 4}$ 33) _____



A)



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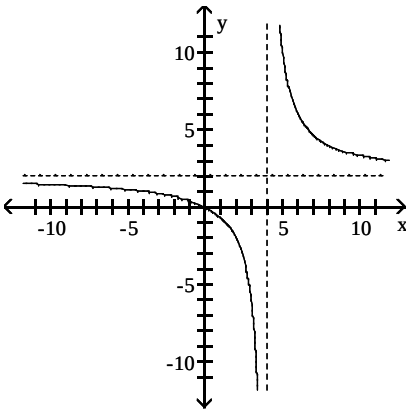

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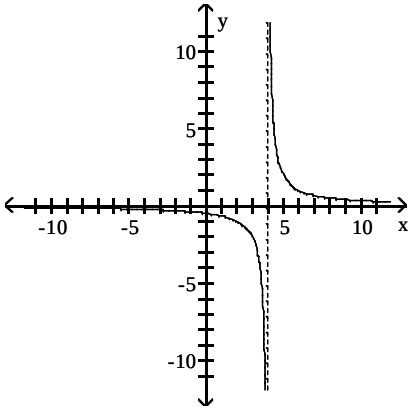

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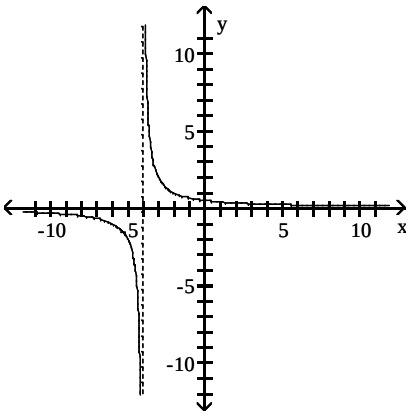
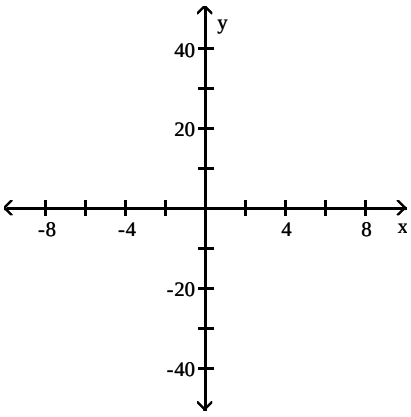
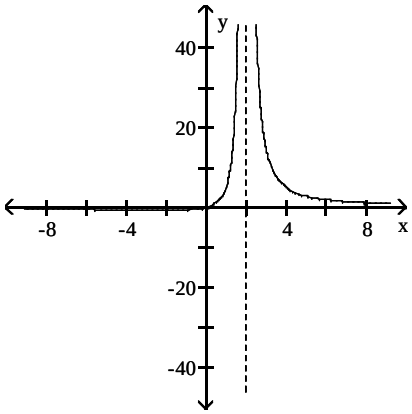


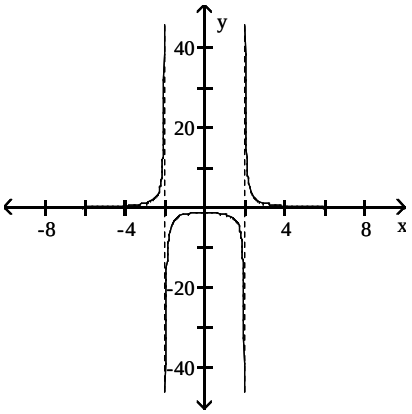
34) $f(x) = \dfrac{5x}{(x + 2)(x - 2)}$ 34) _____



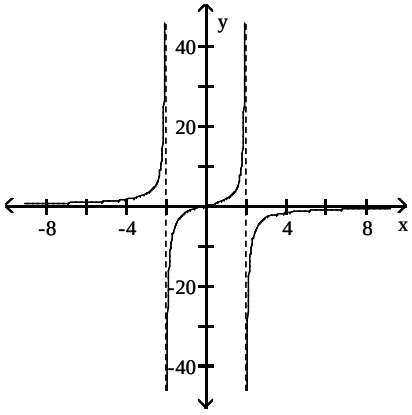
A)



B)



C)



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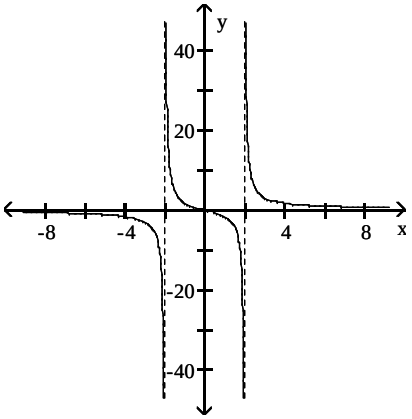
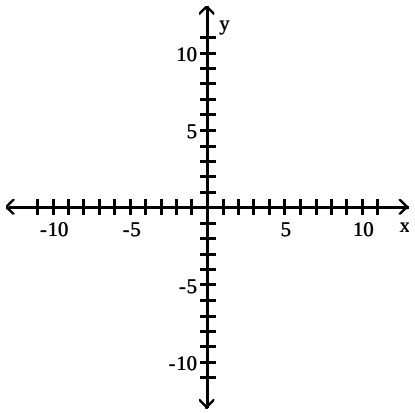
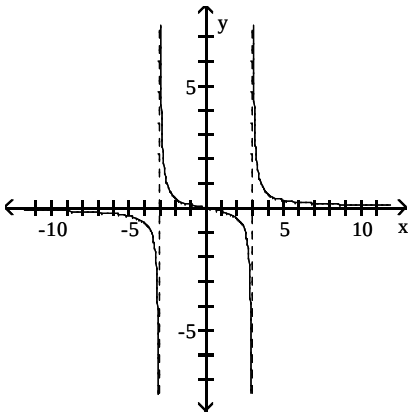


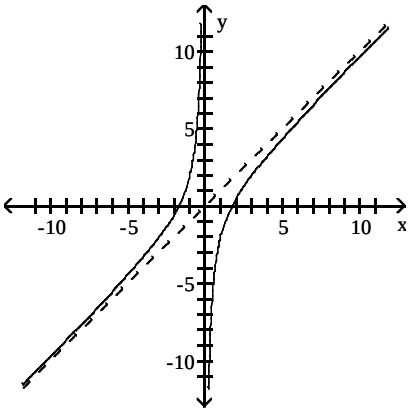
35) $f(x) = \dfrac{x}{x^2 - 9}$ 35) _____



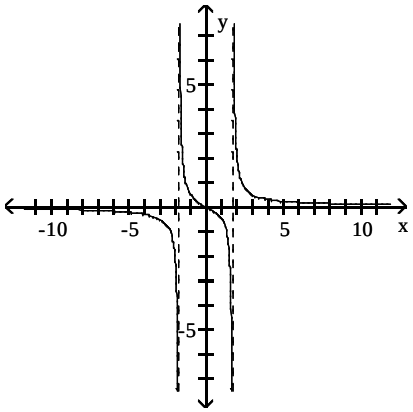
A)



B)



C)



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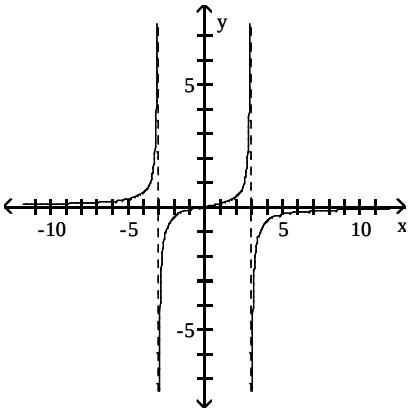


Verify that the values of the variables listed are solutions of the system of equations.

36) 36) _____

$$\begin{cases} x + y = -2 \\ x - y = 6 \end{cases}$$

$x = -2, y = -4$

A) solution B) not a solution

Solve the system of equations by substitution.

37) $\begin{cases} x + 6y = 6 \\ 5x - 8y = -8 \end{cases}$ 37) _____

A) x = 1, y = 0; (1, 0) B) x = 1, y = 1; (1, 1)
C) x = 0, y = 1; (0, 1) D) x = 0, y = 0; (0, 0)

38) $\begin{cases} 5x - 2y = -1 \\ x + 4y = 35 \end{cases}$ 38) _____

A) x = 2, y = 8; (2, 8) B) x = 2, y = 9; (2, 9)
C) x = 3, y = 9; (3, 9) D) x = 3, y = 8; (3, 8)

Solve the system of equations by elimination.

39) $\begin{cases} 3x + 5y = 29 \\ 3x + 2y = 44 \end{cases}$ 39) _____

A) x = −18, y = 3; (−18, 3) B) x = −18, y = 5; (−18, 5)
C) x = −5, y = 18; (−5, 18) D) x = 18, y = −5; (18, −5)

Find the domain of the rational function.

40) $G(x) = \dfrac{x + 6}{x^2 + 49}$ 40) _____

A) {x | x ≠ −7, x ≠ 7, x ≠ −6} B) {x | x ≠ −7, x ≠ 7}
C) {x | x ≠ 0, x ≠ −49} D) all real numbers

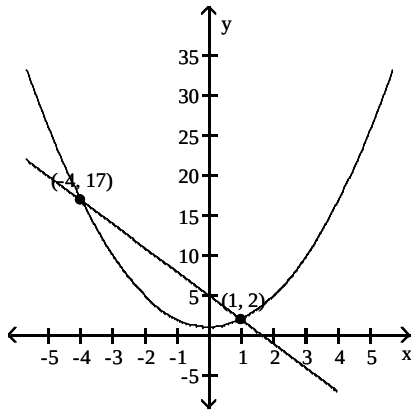
Solve the system of equations by elimination.

41) $\begin{cases} 3x - 5y = -12 \\ 6x + 8y = -24 \end{cases}$ 41) _____

A) x = −4, y = 0; (−4, 0) B) x = 0, y = 4; (0, 4)
C) x = 0, y = −4; (0, −4) D) x = 4, y = 0; (4, 0)

The graph of two equations along with the points of intersection are given. Substitute the points of intersection into the systems of equations. Are the points of intersection solutions to the system of equations (Y/N)?

42) 42) _____



$\begin{cases} x^2 = y - 1 \\ y = -3x + 5 \end{cases}$

A) No B) Yes

Solve the system of equations using substitution.

43) 43) _____

$\begin{cases} x^2 + y^2 = 13 \\ x + y = 5 \end{cases}$

A) x = 3, y = −2; x = 2, y = −3 or (3, −2), (2, −3)
B) x = −3, y = −2; x = −2, y = −3 or (−3, −2), (−2, −3)
C) x = 3, y = 2; x = 2, y = 3 or (3, 2), (2, 3)
D) x = −3, y = 2; x = −2, y = 3 or (−3, 2), (−2, 3)

44) 44) _____

$\begin{cases} xy = 90 \\ x + y = -19 \end{cases}$

A) x = −9, y = 10; x = −10, y = 9 or (−9, 10), (−10, 9)
B) x = −9, y = −10; x = −10, y = −9 or (−9, −10), (−10, −9)
C) x = 9, y = 10; x = 10, y = 9 or (9, 10), (10, 9)
D) x = 9, y = −10; x = 10, y = −9 or (9, −10), (10, −9)

Solve using elimination.

45) 45) _____

$\begin{cases} x^2 + y^2 = 58 \\ x^2 - y^2 = 40 \end{cases}$

A) x = 7, y = 3; x = 3, y = 7; x = −7, y = −3; x = −3, y = −7 or (7, 3), (3, −7), (−7, −3), (−3, −7)
B) x = 7, y = −3; x = 7, y = 3 or (7, −3), (7, 3)
C) x = 7, y = 3; x = −7, y = 3; x = 7, y = −3; x = −7, y = −3 or (7, 3), (−7, 3), (7, −3), (−7, −3)
D) x = −7, y = −3; x = −3, y = −7 or (−7, −3), (−3, −7)

46) 46) _____

$$\begin{cases} 2x^2 + y^2 = 17 \\ 3x^2 - 2y^2 = -6 \end{cases}$$

A) x = 2, y = 3; x = 2, y = –3; x = –2, y = 3; x = –2, y = –3
or (2, 3), (2, –3), (–2, 3), (–2, –3)

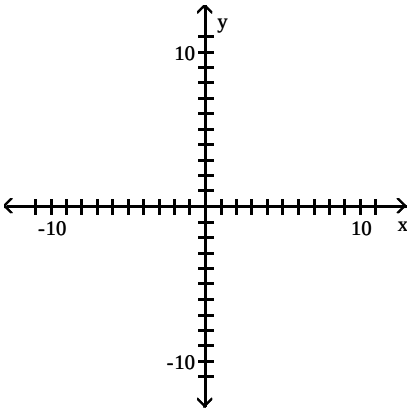
B) x = 1, y = 3; x = –1, y= –3 or (1, 3), (–1, –3)

C) x = 2, y = –3; x = –2, y = 3 or (2, –3), (–2, 3)

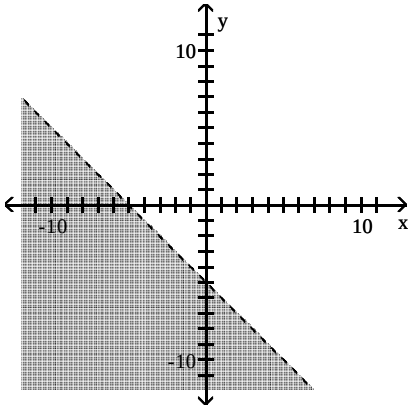
D) x= 1, y = 3; x = 1, y = –3; x = –1, y = 3; x = –1, y = –3
or (1, 3), (1, –3), (–2, 3), (–2, –3)

Graph the inequality.

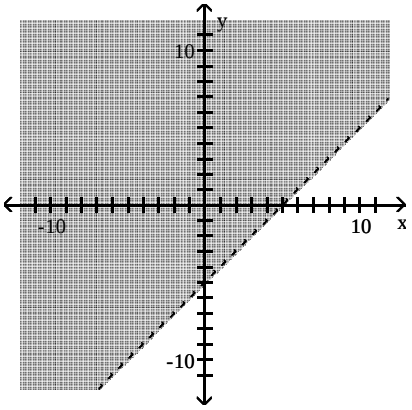
47) $x + y < -5$ 47) _____



A)



B)



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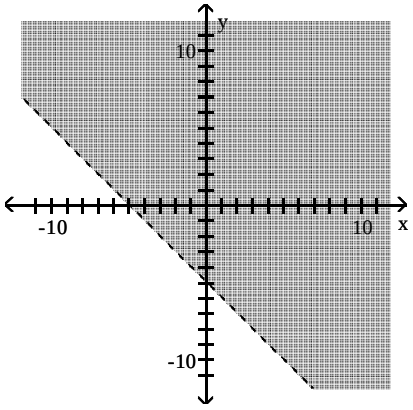
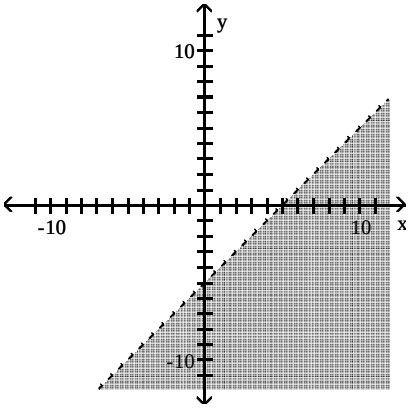
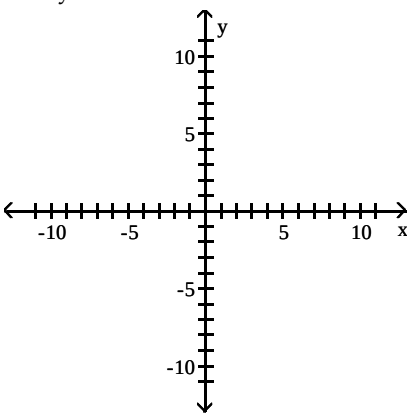


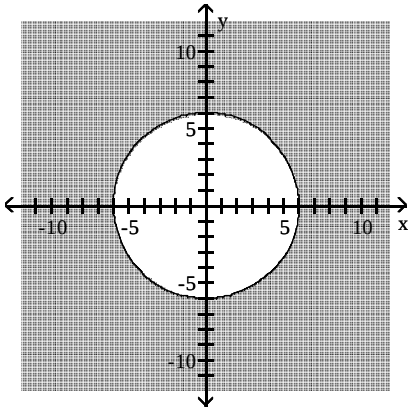
D)



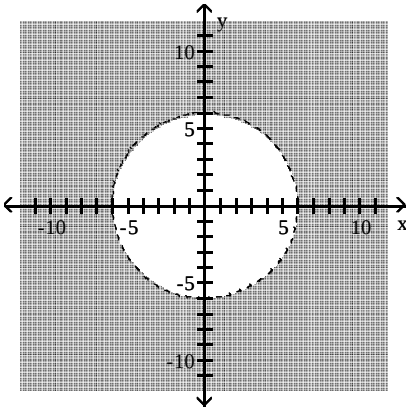
48) $x^2 + y^2 \leq 36$ 48) _____



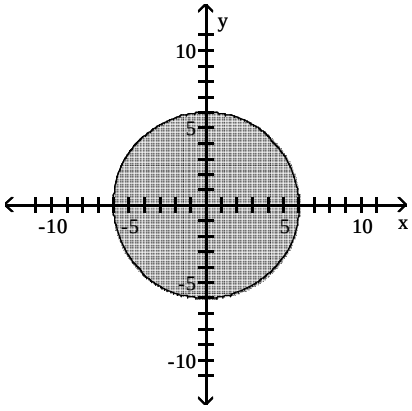
A)



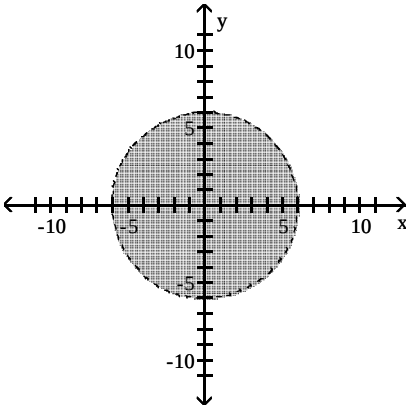
B)



C)



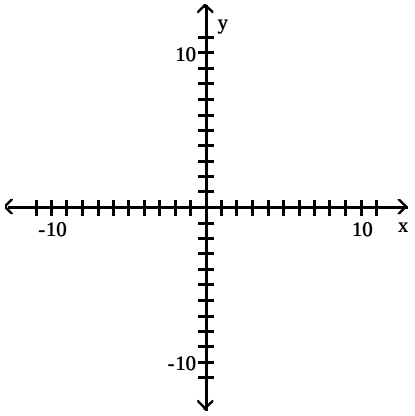
D)



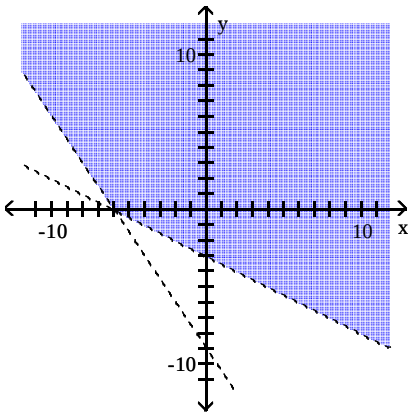
Graph the solution set of the system of inequalities or indicate that the system has no solution.

49) $\begin{cases} -x + 2y \leq -6 \\ 3x + 2y > -18 \end{cases}$

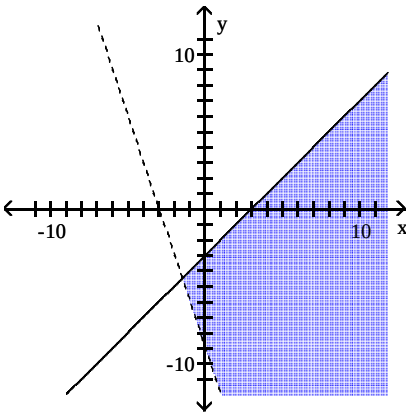
49) _____



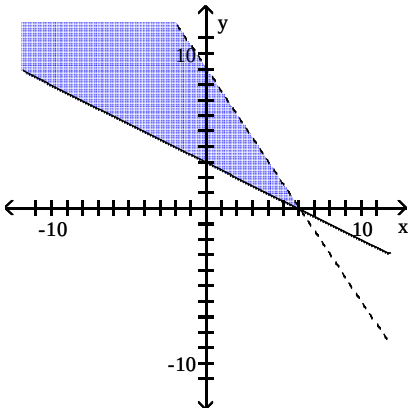
A)



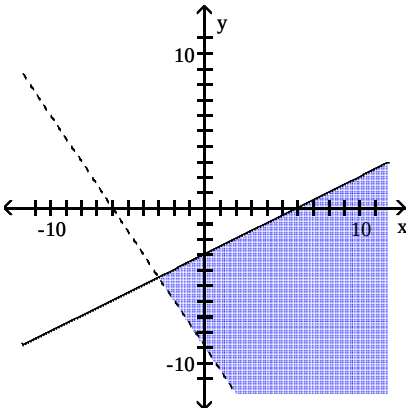
B)



C)

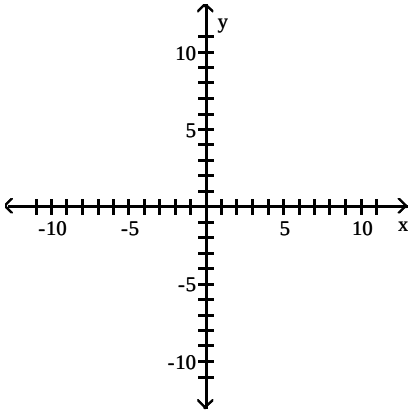


D)

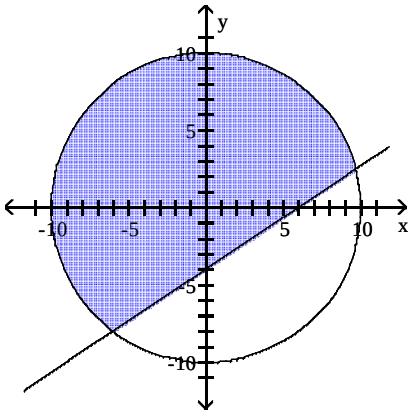


50) 50) _____

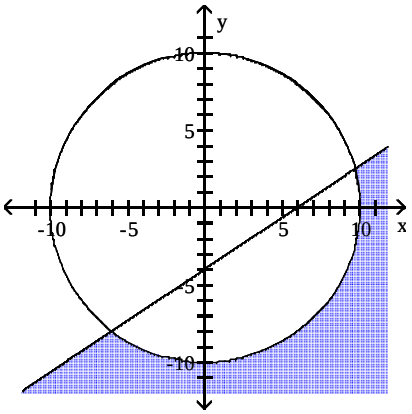
$$\begin{cases} x^2 + y^2 \le 100 \\ -4x + 6y \le -24 \end{cases}$$



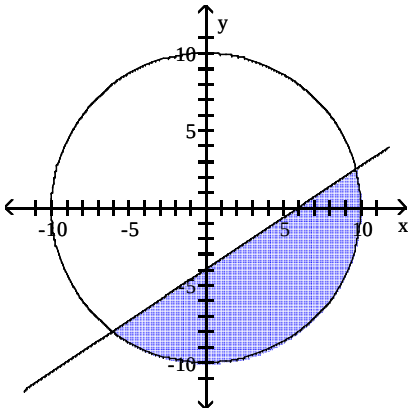
A)



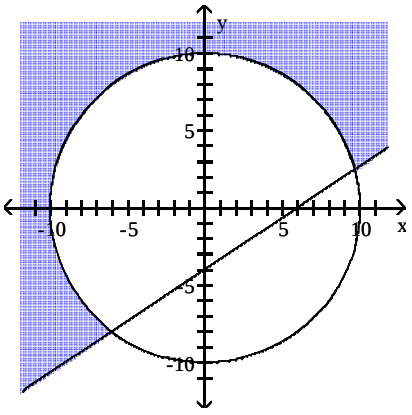
B)



C)



D)



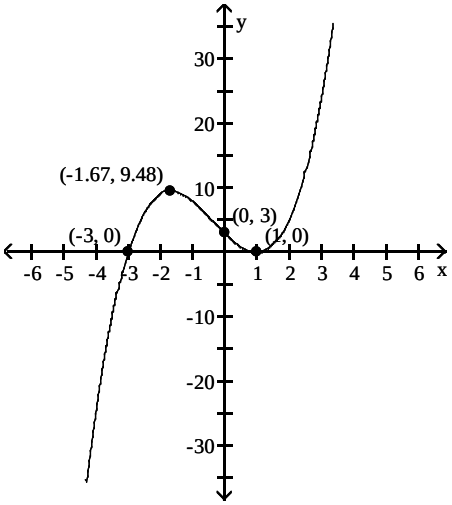
Solve the system of equations. If the system has no solution, say that it is inconsistent.

51) 51) _____

$$\begin{cases} x - 4y = -10 \\ 2x - 8y = -17 \end{cases}$$

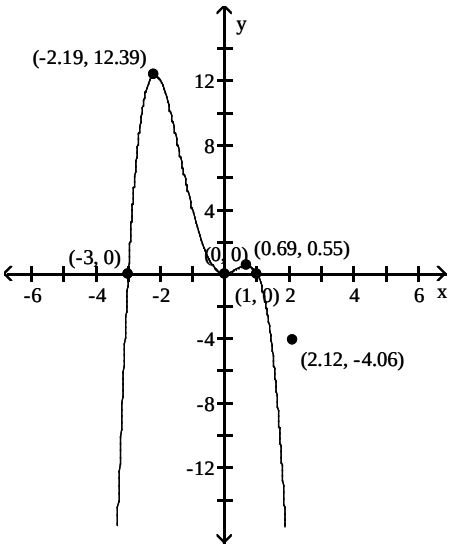
A) x = 2, y = 3; (2, 3)
B) x = 4, y = 2; (4, 2)
C) x = 2, y = 4; (2, 4)
D) inconsistent

1) B
2) D
3) C
4) B
5) D
6) D
7) A
8) B
9) B
10) A
11) D
12) D
13) (a) For large values of $|x|$, the graph of f(x) will resemble the graph of $y = x^3$.
(b) y–intercept: (0, 3), x–intercepts: (1, 0) and (–3, 0)
(c) The graph of f crosses the x–axis at (–3, 0) and touches the x–axis at (1, 0).
(e) Local minimum at (1, 0); Local maximum at (–1.67, 9.48)
(f)



(g) Domain of f: all real numbers; range of f: all real numbers
(h) f is increasing on $(-\infty, -1.67)$ and $(1, \infty)$; f is decreasing on (9.48, 1)

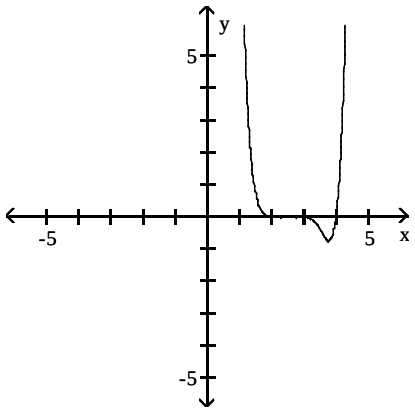
14) (a) For large values of $|x|$, the graph of f(x) will resemble the graph of $y = -x^4$.
(b) y–intercept: (0, 0), x–intercepts: (–3, 0) , (0, 0), and (1, 0)
(c) The graph of f crosses the x–axis at (1, 0) and (–3, 0) and touches the x–axis at (0, 0).
(e) Local maxima at (–2.19, 12.39) and (0.69, 0.55); Local minimum at (0, 0)
(f)



(g) Domain of f: all real numbers; range of f: $(-\infty, 12.39]$
(h) f is increasing on $(-\infty, -2.19)$ and (0, 0.69); f is decreasing on $(-2.19, 0)$ and $(0.69, \infty)$

15) B

16) a) The x–intercepts are 2, 3, and 4. The y–intercept is 288.
b) The graph crosses the x–axis at 2 and 4, and touches it at 3.
c) The graph resembles $f(x) = x^6$ for large values of $|x|$.
d) Maximum at (3, 0); minima at (2.57, –0.05) and (3.77, –0.76)
e) The graph has 3 turning points.
f)



17) B
18) C
19) C
20) A
21) A
22) A
23) D

24) C
25) D
26) A
27) B
28) C
29) B
30) C
31) B
32) B
33) B
34) D
35) A
36) B
37) C
38) D
39) D
40) D
41) A
42) B
43) C
44) B
45) C
46) A
47) A
48) C
49) D
50) C
51) D