Math120 Cumulative Review
This is to help prepare you for the final exam.
It is not all inclusive of the material covered in your course.
Therefore items not on this review may appear on the exam.

1. Solve the formula for the indicated variable.

$$\mathrm{P} = 2\,\mathrm{L} + 2\,\mathrm{W} \text{ for } \mathrm{W}$$

2. Solve the formula for the variable y.

$$5 = 7x - 8y$$

3. Solve the formula for the indicated variable.

$$\mathrm{R} = \mathrm{nE} - \mathrm{nr}, \text{ for } \mathrm{n}$$

4. The mathematical model $C = 700x + 30,000$ represents the cost in dollars a company has in manufacturing x items during a month. How many items were produced if costs reached $\$240,000$?
5. Determine whether the equation is an identity, a conditional, or contradiction. Provide the solution set. Show your work for credit.

$$\frac{5x+7}{7} + \frac{2}{7} = -\frac{5x}{3}$$

6. Determine whether the equation is an identity, a conditional, or contradiction. Provide the solution set. Show your work for credit.

$$24(x-2) = 3(8x-5) - 33$$

7. Determine whether the equation is an identity, a conditional, or contradiction. Provide the solution set. Show your work for credit.

$$-6(x+5) + (12x) = 6(x+9) - 12$$

8. Multiply and/or divide, as indicated. Simplify the answer.

$$\frac{\sqrt{-15} \cdot \sqrt{-5}}{\sqrt{3}}$$

9. Use these equations to convert between the two systems.

$$C = \frac{5}{9}(F - 32) \quad F = \frac{9}{5}C + 32$$

Determine the Fahrenheit temperature for a temperature of $90^\circ\mathrm{C}$. Leave your answer as a reduced fraction, if necessary.

10) In a chemistry class, 3 liters of a 4% silver iodide solution must be mixed with a 10% solution to get a 6% solution. How many liters of the 10% solution are needed?

11) A chemist needs 130 milliliters of a 72% solution but has only 17% and 82% solutions available. Find how many milliliters of each that should be mixed to get the desired solution.

12) Chuck and Dana agree to meet in Chicago for the weekend. Chuck travels 250 miles in the same time that Dana travels 230 miles. If Chuck's rate of travel is 4 mph more than Dana's, and they travel the same length of time, at what speed does Chuck travel?

13) Levi borrowed $\$4509$ at 9% simple interest for 6 months (note: this is not years). How much will the interest amount to? Round your answer to the nearest penny as needed.

14) Solve the equation by factoring.

$$3x^2 + 7x - 20 = 0$$

15. Solve the equation by the square root property.

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

16. Solve the equation by completing the square or using the quadratic formula.

$$4x^2 + 12x + 2 = 0$$

17. Solve the problem. A toy rocket is shot vertically upward from the ground. Its height in feet from the ground in t seconds is given by $h = -16t^2 + 128t$. At what time or times will the ball

be 152 ft from the ground? Leave your answer as a reduced fraction or tenth of a second, if necessary.

18. In the morning, Mary drove to an appointment at 50 mph . Her average speed on the return trip in the afternoon was 40 mph . The return trip took $\frac{1}{8}$ hour longer. How far did she travel to the appointment?
19. Tom Quig traveled 290 miles east of St. Louis. For most of the trip he averaged 70 mph , but for one period of time he was slowed to 20 mph due to a major accident. If the total time of travel was 7 hours, how many miles did he drive at the reduced speed?
20. Mardi received an inheritance of $\$50,000$. She invested part at 1.75% and deposited the remainder in tax-free bonds at 2%. Her total annual income from the investments was $\$925$. Find the amount invested at 1.75%.
21. Roberto invested some money at 2.5%, and then invested $\$5000$ more than twice this amount at 4%. His total annual income from the two investments was $\$1565.00$. How much was invested at 4% ?
22. Write the number as the product of a real number and i.

$$\sqrt{-49}$$

23. Multiply or divide, as indicated. Simplify the answer.

$$\sqrt{-5} \cdot \sqrt{-5}$$

24. Find the sum or difference. Write the answer in standard form.

$$3\sqrt{2} - (7\sqrt{2} + i) + 9i - (-2\sqrt{2} + 9i)$$

25. Find the sum or difference. Write the answer in standard form.

$$(-1 + 9i) - (6 + 5i) - (-3 + 7i)$$

26. Simplify the expression. Write the answer in standard complex form (a+bi).

$$(9 - 4i)(8 - 2i)$$

27. Simplify the expression. Write the answer in standard complex form (a+bi).

$$\frac{7+2i}{6-9i}$$

28. Determine the product. Write the answer in standard form

$$(6-4i)^2$$

29. Solve the equation by the zero-factor property.

$$x^2+7x-18=0$$

30. Solve the equation by the square root property.

$$(x-5)^2=49$$

31. Solve the equation by the zero-factor property.

$$14x^2+43x+20=0$$

32. Solve the equation by completing the square or using the quadratic formula.

$$7x^2+10x+2=0$$

33. Solve the equation by completing the square.

$$8x^2+7x=-2$$

34. Solve the cubic equation using factoring and completing the square or quadratic formula.

$$x^3+64=0$$

35. Solve the equation (be sure to check your solution).

$$x=\sqrt{2x+15}$$

36. Solve the equation (be sure to check your solution).

$$\frac{18}{x-3}+2=\frac{8}{x-3}$$

37. Solve the inequality. Give the solution set in interval notation.

$$-3(5y-7) < -18y+6$$

38. Solve the absolute value equation.

$$|2x-8| = 7$$

39. Solve the inequality. Provide the answer in interval notation.

$$-1 \leq \frac{x+1}{-2} \leq 3$$

40) Solve the inequality. Give the solution set in interval notation.

$$|2-x| \leq 17$$

41. Solve the inequality. Write the solution set in interval notation.

$$|-3-8x| > 6$$

42. Solve the inequality. Give the solution set in interval notation.

$$v^2+7v+10 \geq 0$$

43. For the points P and Q , determine the distance $\mathrm{d}(\mathrm{P},\mathrm{Q})$.

$$\mathrm{P}(6,5), \mathrm{Q}(-2,-4)$$

44. Determine the center-radius form of the equation of the circle with center ($-5,3$), radius $\sqrt{2}$
45. Determine the center-radius form of the equation of the circle having a diameter with endpoints $(-2,1)$ and $(14,5)$. List the center as an ordered pair followed by the equation.
46. Determine the center and radius of the circle

$$x^2+y^2+4x-16y-13=0$$

47. Complete the square in x and y to determine the center and radius of the circle.

$$4x^2 + 4y^2 - 16x + 8y - 16 = 0$$

48. Provide the domain and range of the relation in interval notation.

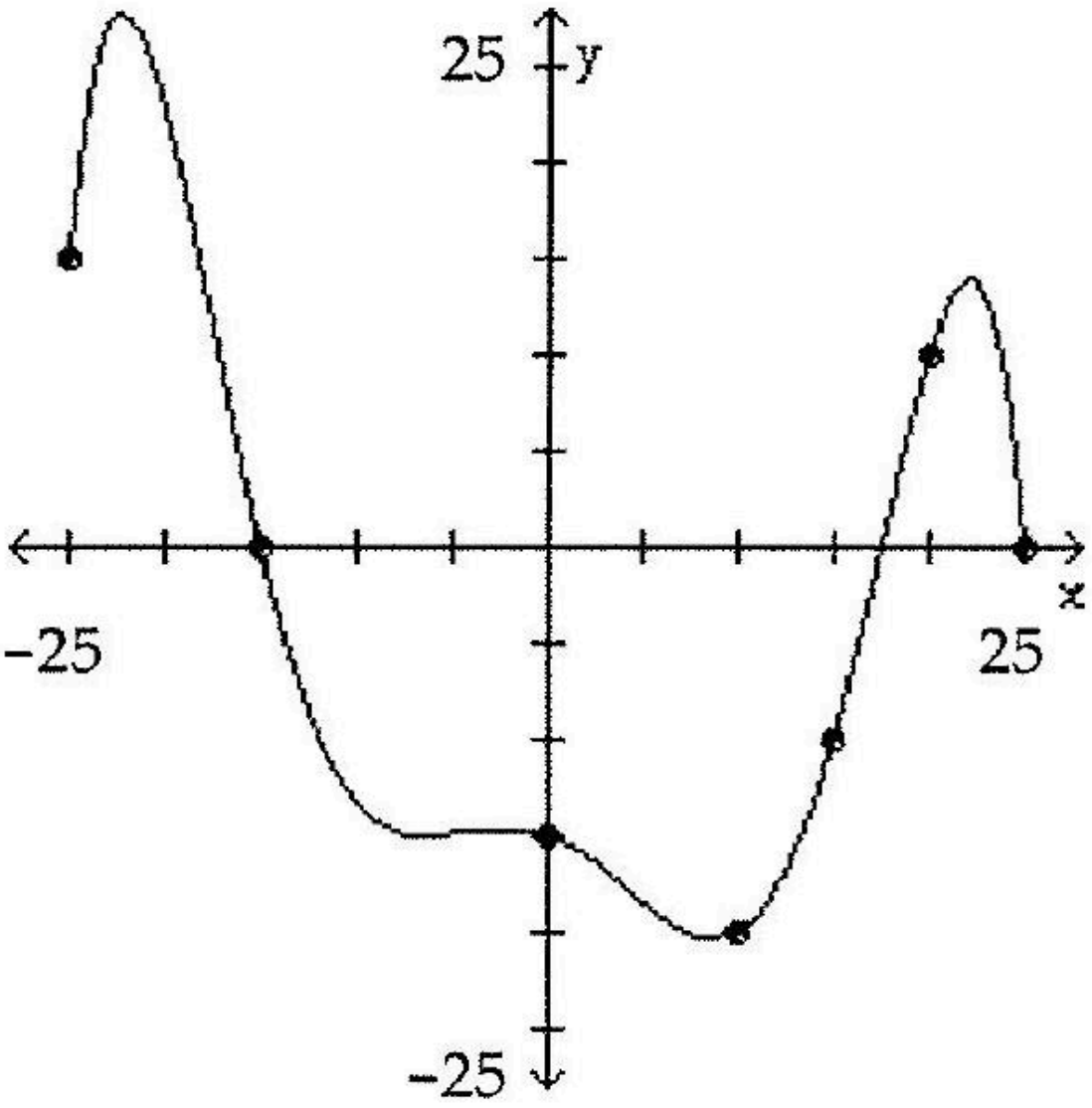
$$y = \sqrt{5x - 3}$$

49. Provide the domain and range of the relation in interval notation.

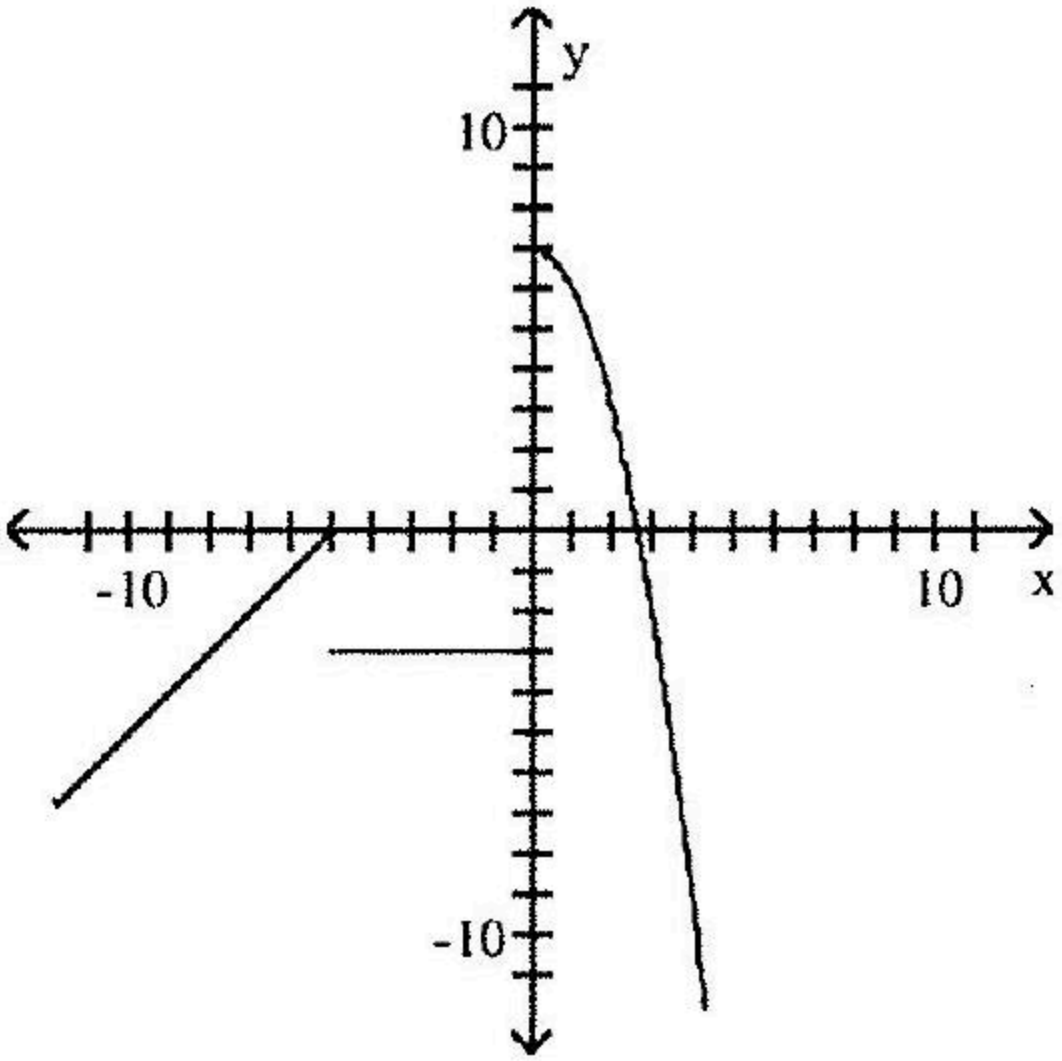
$$y = \frac{-6}{x - 7}$$

50. Determine $f(-3)$ when $f(x) = x^2 - 2x + 4$ and simplify your answer.
51. Determine $f(k - 1)$ when $f(x) = 4x^2 + 3x - 6$ and simplify your answer.
52. The graph of $y = f(x)$ is given. Use the graph to find the function value.

Determine $f(20)$.

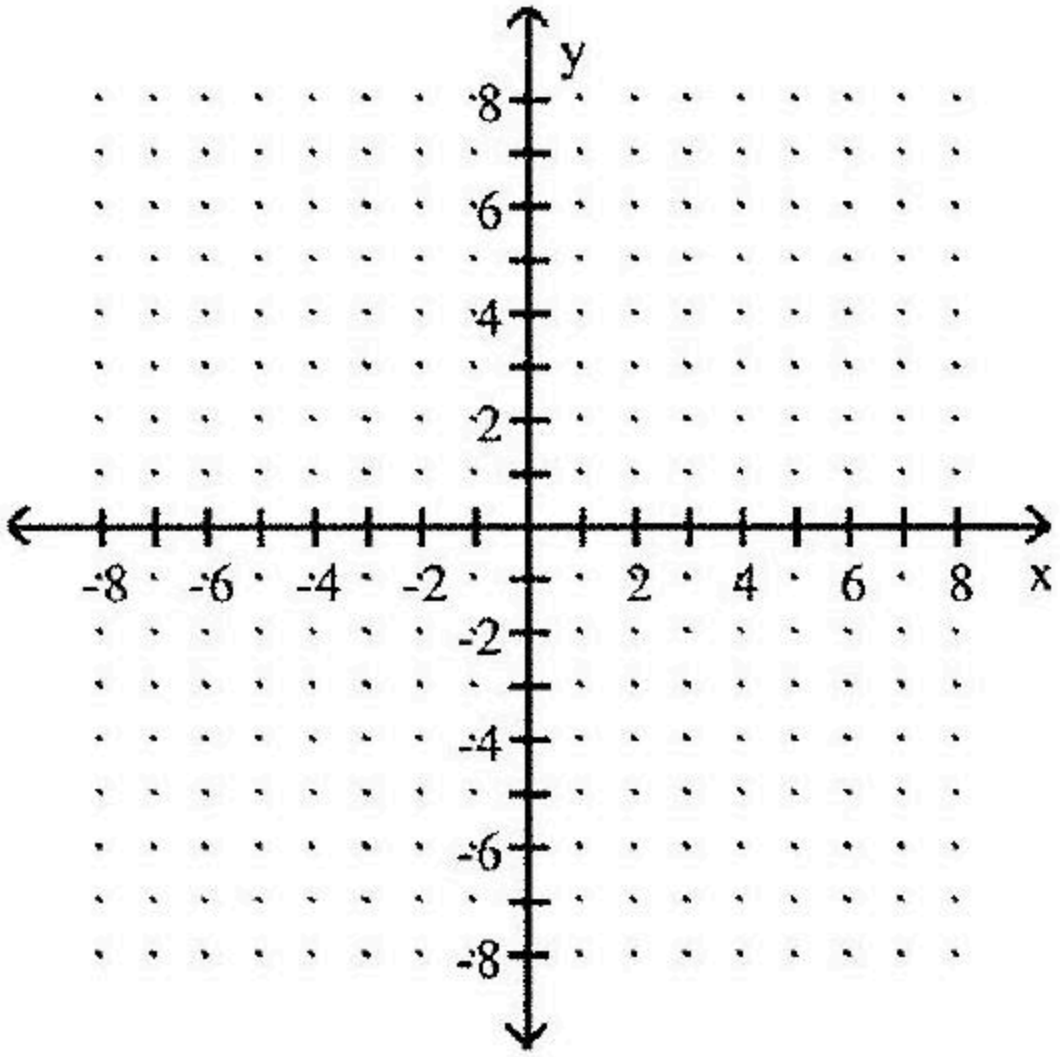


53) Determine the largest open intervals of the domain over which the function is increasing, decreasing, and/or constant.



54) Graph the line and provide the x and y intercepts as ordered pairs on the line to the right.

$$4x - 8y = 24$$



55) Determine the slope of the line
through $(5, -6)$ and $(-8, -3)$

56) Write slope-intercept form of the equation for the line parallel to $-7x + 2y = 27$, and through $(-5, 2)$

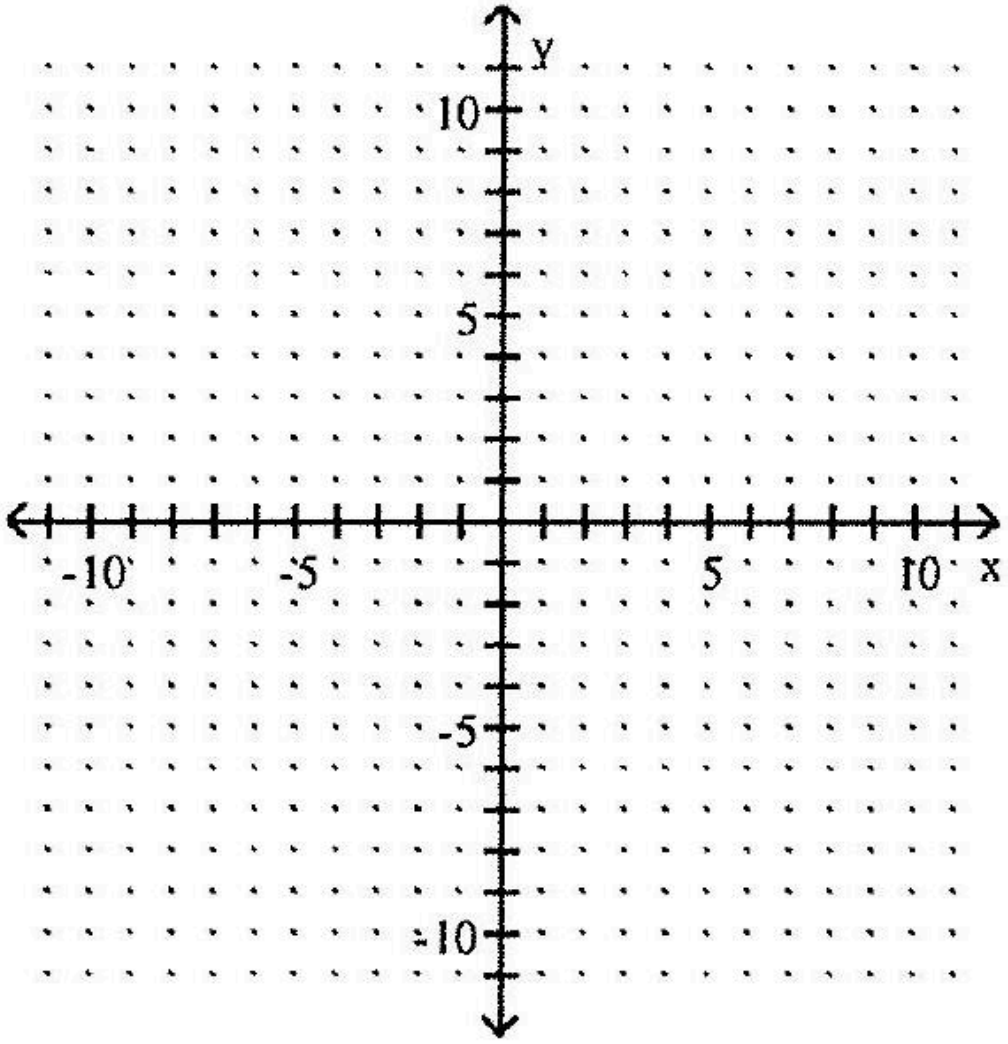
57) Write point-slope form of the equation for the line perpendicular to $9x + 7y = 43$, through $(4, -1)$ (do not simplify)

58) Determine $f(-9)$ for the piecewise defined function

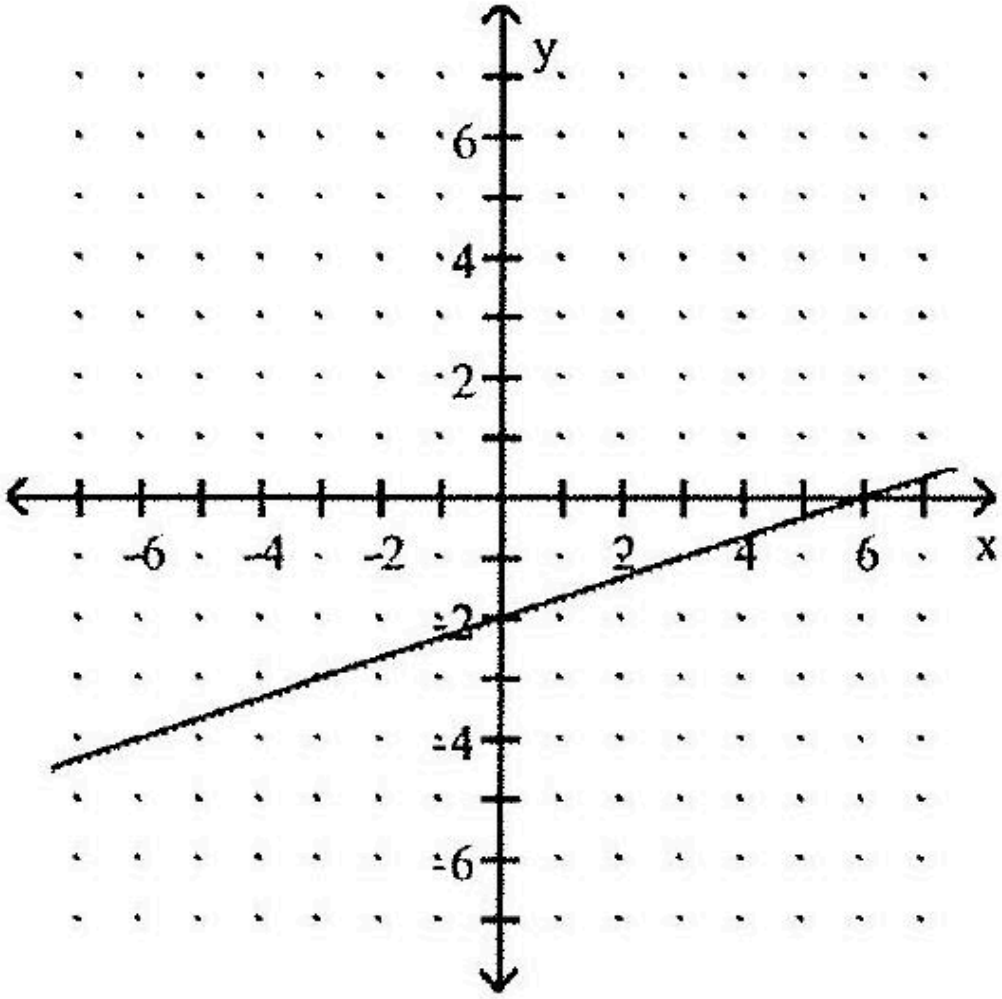
$$f(x) = \begin{cases} 6x + 1, & \text{if } x < 9 \\ 9x, & \text{if } 9 \leq x \leq 13 \\ 9 - 9x, & \text{if } x > 13 \end{cases}$$

59. Determine the slope and y-axis intercept of the line and sketch the graph.

(note: provide the y-intercept as an ordered pair on the line to the right.) $4x + 5y = 28$



60. The graph of a linear function f is shown. Write the equation that defines $f(x)$. Write the equation in slope-intercept form.



61. Describe how the graph of the equation relates to the graph of $y = x^2$ and graph the function.

State any horizontal shift (Left or Right), vertical shift (Up or Down),

H: _____
stretching or shrinking in the vertical direction,
V: _____
and if the graph is reflected (flipped).
Stretch/Shrink: _____
R : _____

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

62. Describe how the graph of the equation relates to the graph of $y = x^2$ and graph the function.

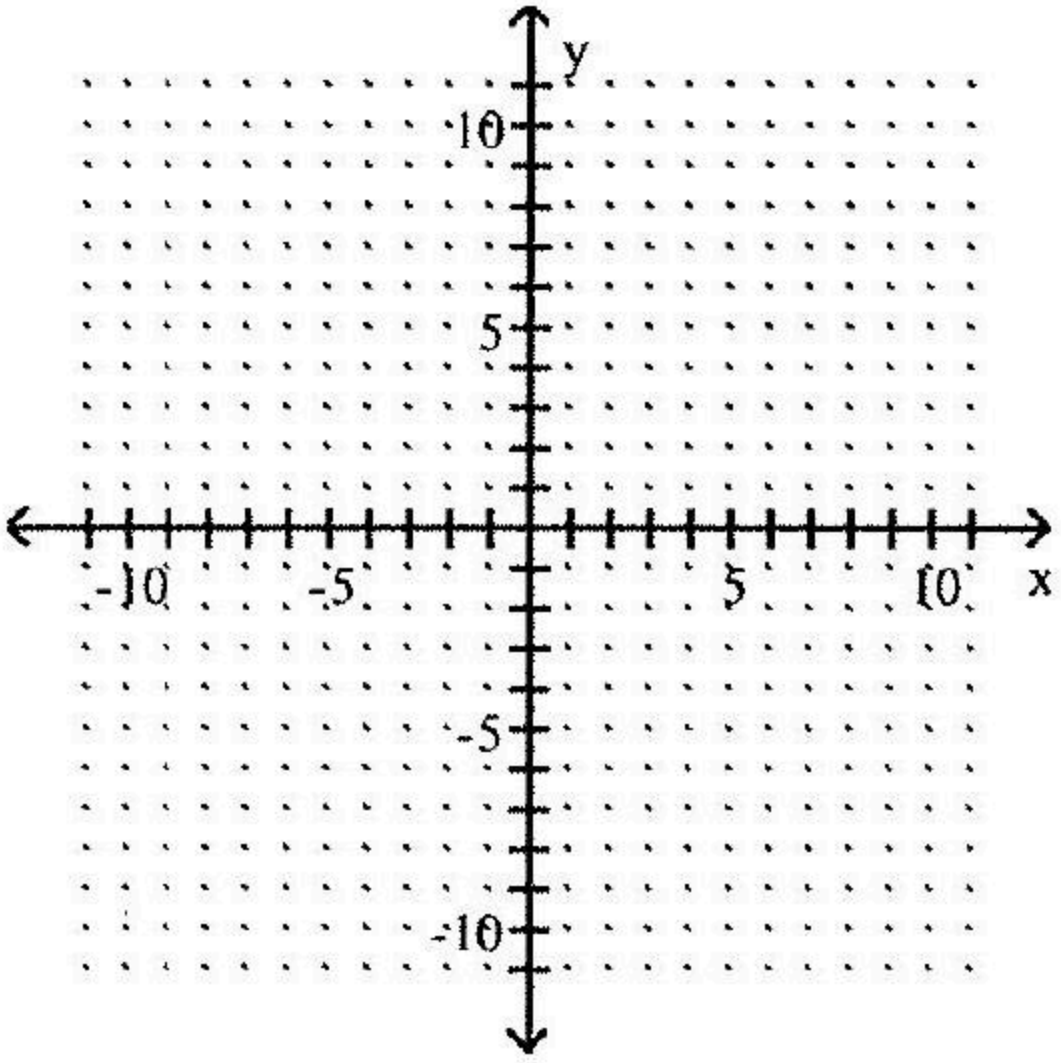
State any horizontal shift (Left or Right), vertical shift (Up or Down), stretching or shrinking in the vertical direction, and if the graph is reflected (flipped).

H: _____
V: _____
Stretch/Shrink: _____
R : _____

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

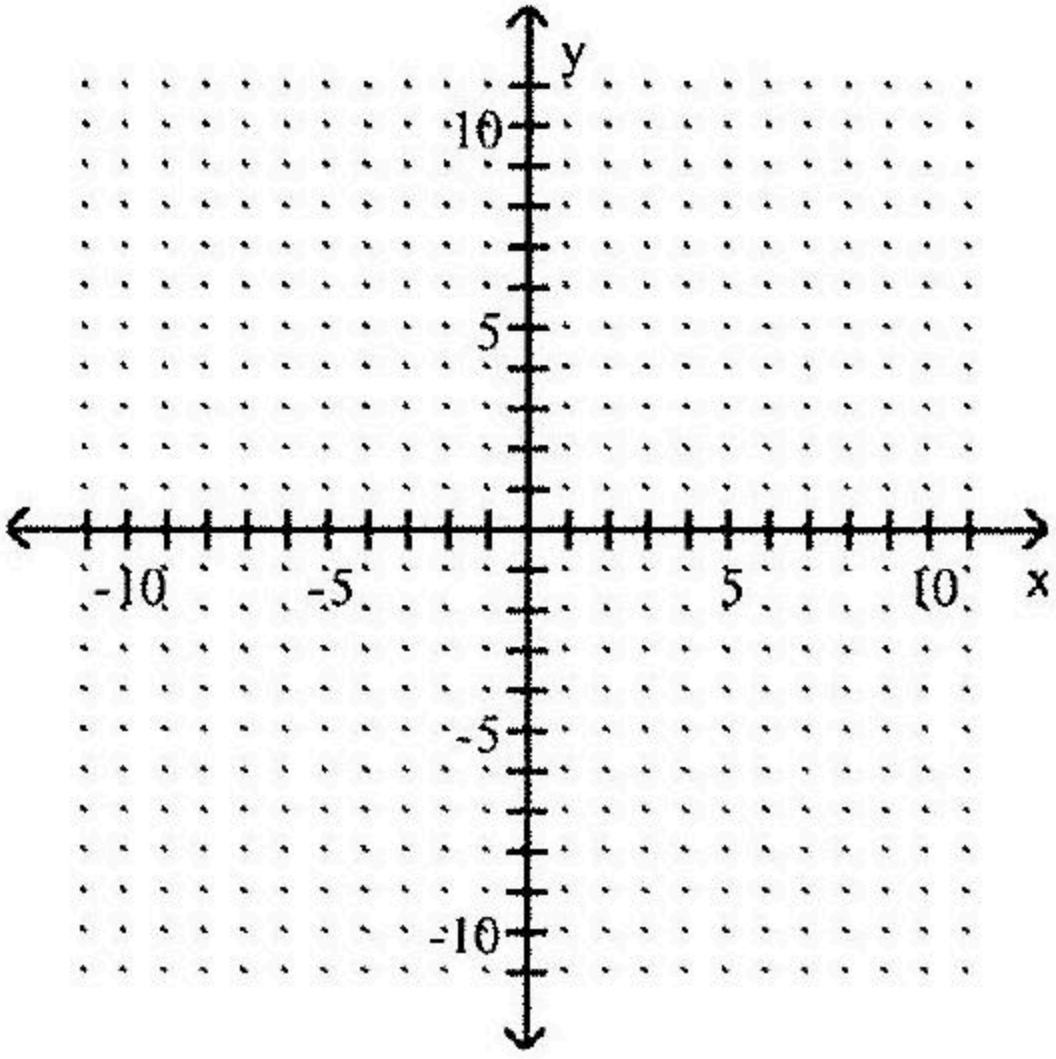
63. Graph the function and provide its domain and range in interval notation.

$$y = \sqrt{x+4}$$



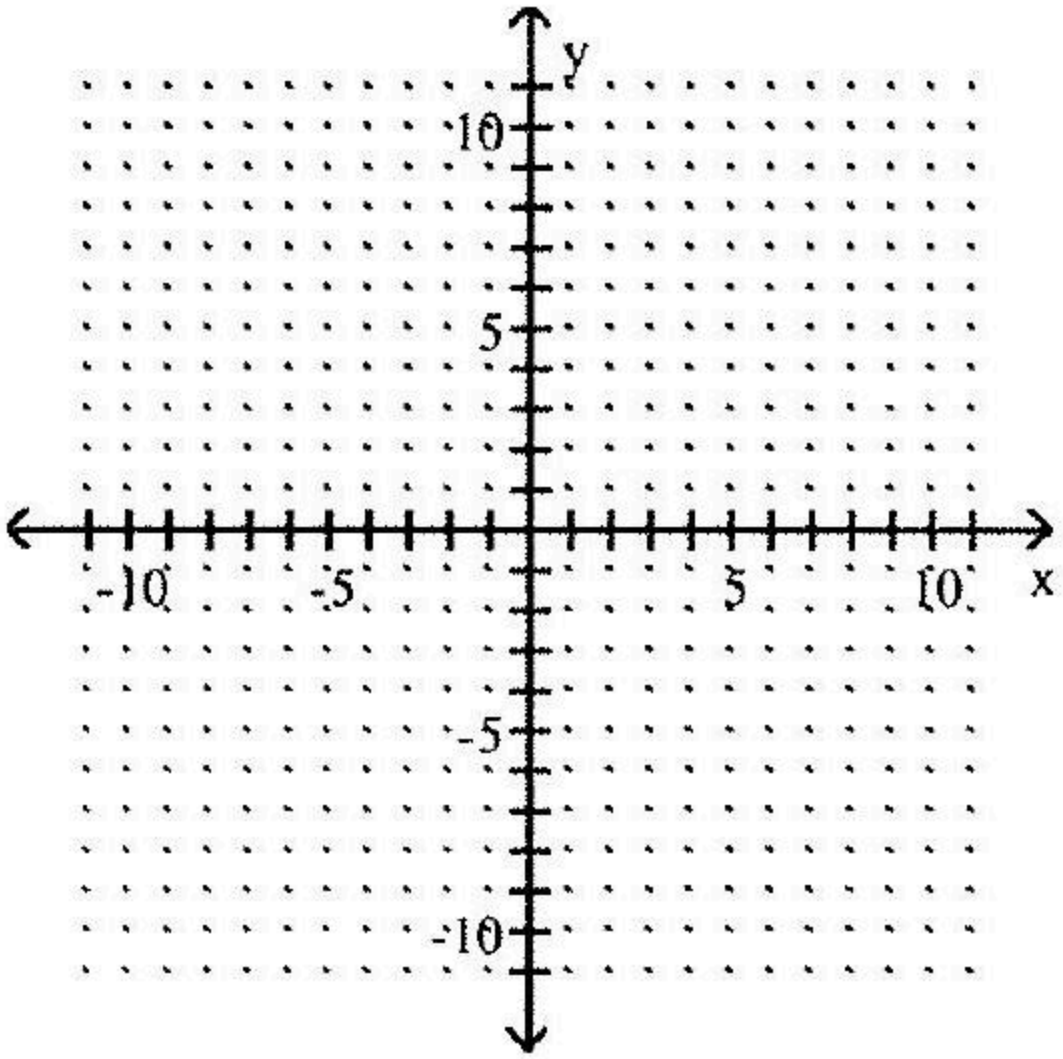
64) Graph the function and provide its domain and range in interval notation.

$$g(x) = -\sqrt{x+1} - 2$$



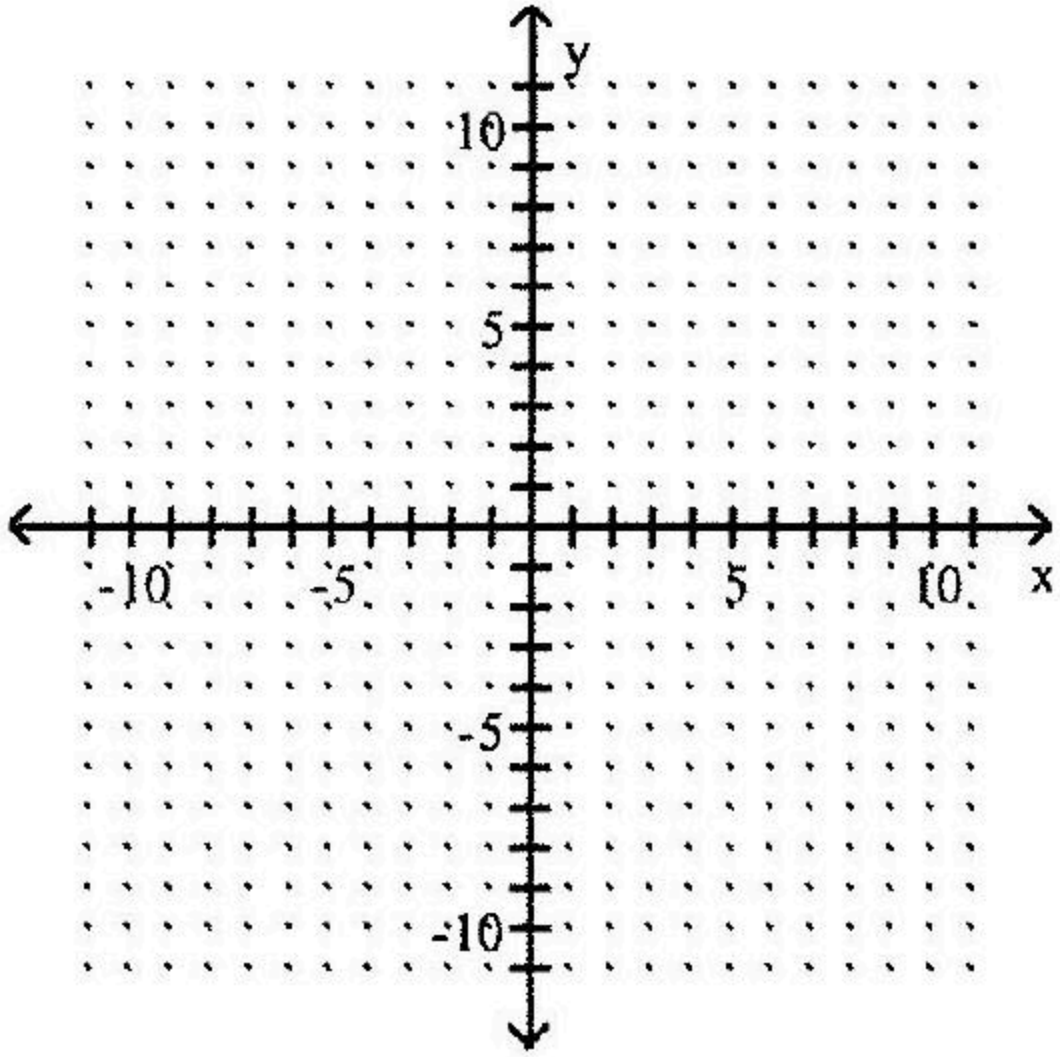
65) Graph the function and provide its domain and range in interval notation.

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



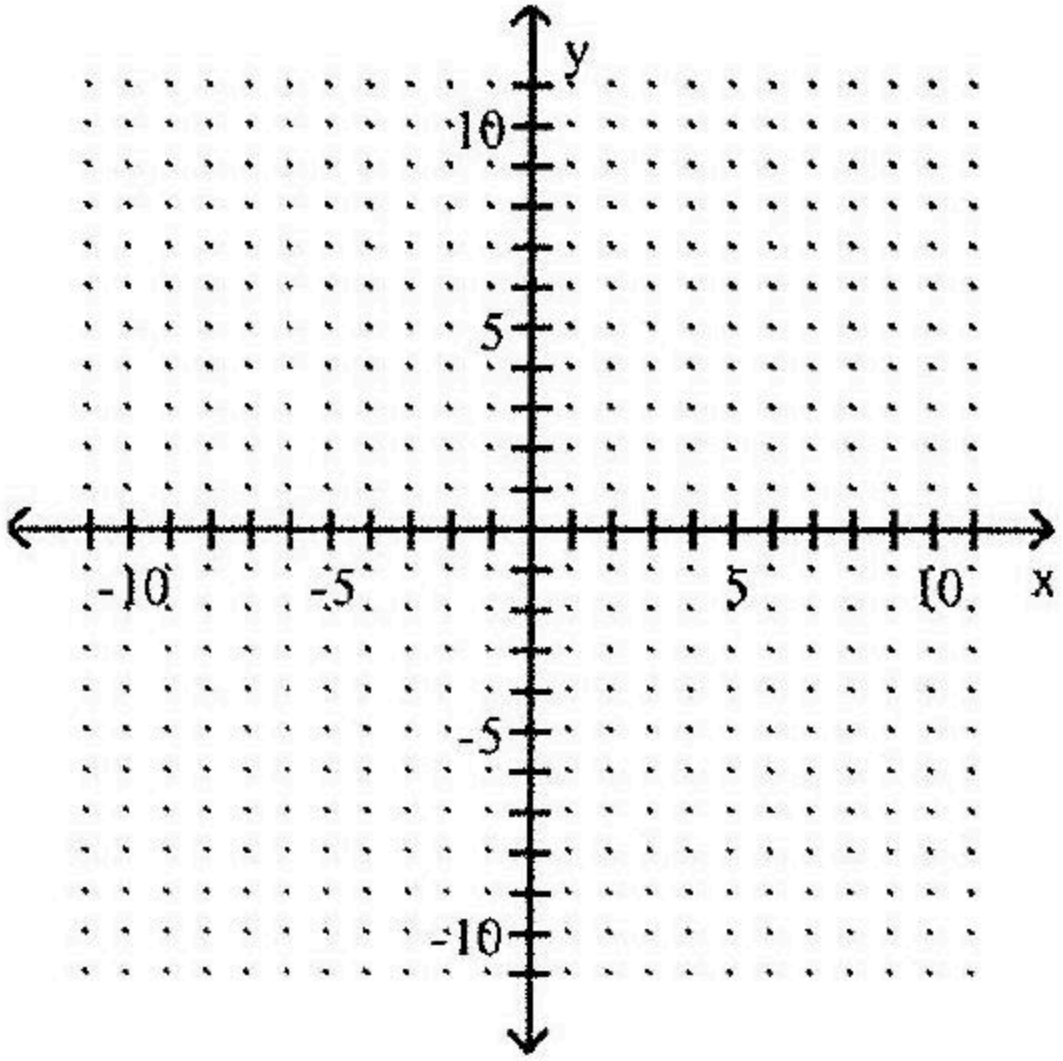
66) Graph the function and provide its domain and range in interval notation.

$$y = \frac{1}{3}(x-4)^3$$



67) Graph the function and provide its domain and range in interval notation.

$$g(x) = \frac{1}{2}|x + 4| - 3$$



68) Determine whether the equation has a graph that is symmetric with respect to the y-axis, the x-axis, the origin, or none of these and if the function is even or odd.
(show your work for credit)

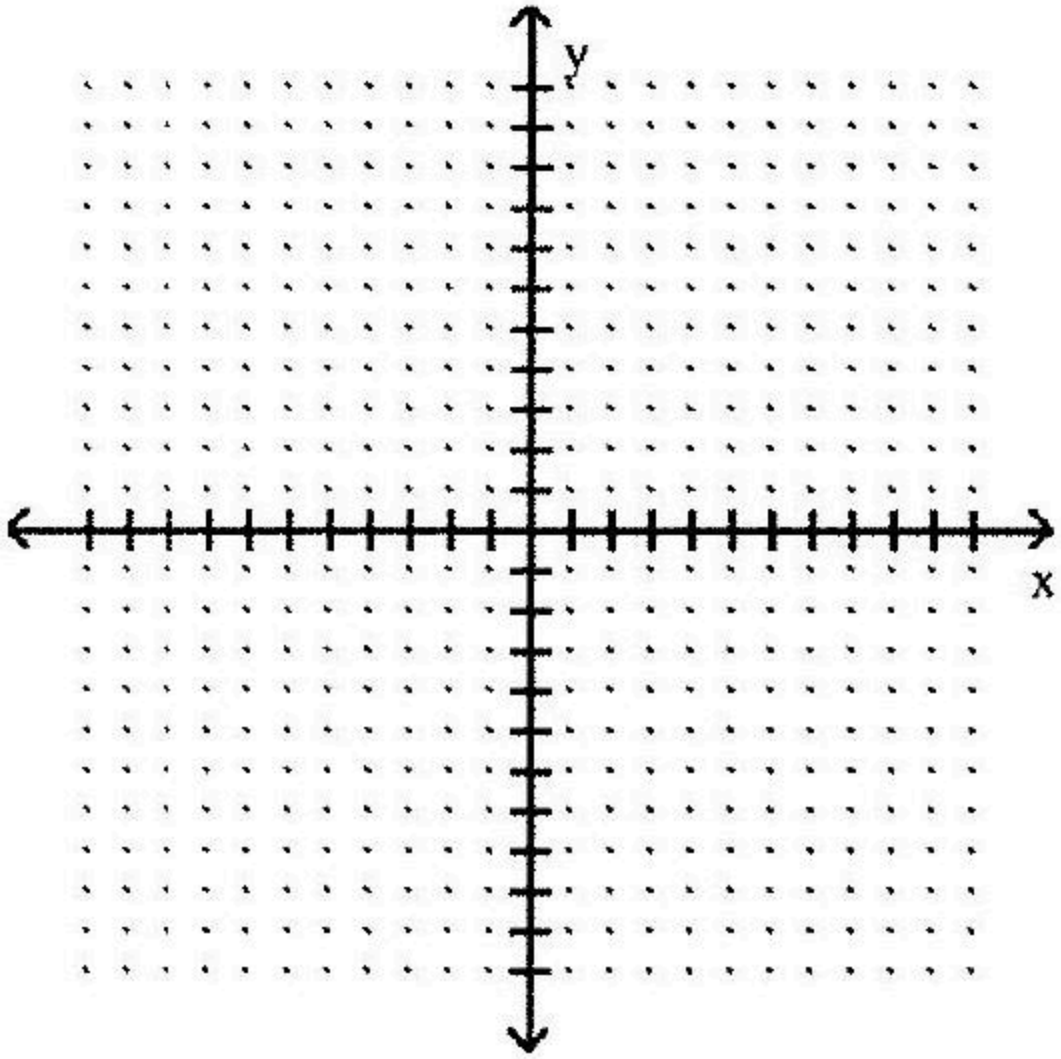
$$y = 3x^2 + 5$$

69. Determine whether the equation has a graph that is symmetric with respect to the y-axis, the x-axis, the origin, or none of these and if the function is even or odd.
(show your work for credit)

$$y = -9x^3 + 2x$$

70. A driver wants to gauge the fuel efficiency of her vehicle at speeds of 30 mph and above. She notices that traveling at an average speed of 30 mph results in a rating of 25 mpg , whereas at an average speed of 35 mph , her car rates 10 mpg . Find a linear equation to model the gas mileage y for an average speed of x mph . Find the slope-intercept form of the equation of the line.
71. Determine the vertex. Then sketch the graph of the funtion.

$$f(x) = 2x^2 - 12x + 20$$



72) Use synthetic division to perform the division. Show your work for credit.

$$\frac{x^3 - x^2 + 4}{x + 2}$$

73. Use synthetic division to perform the division. Show your work for credit.

$$\frac{4x^3 - 19x^2 - 28x - 12}{x - 6}$$

74. Use the remainder theorem and synthetic division to determine $f(k)$.

Show your work for credit.

$$\mathrm{k = 2; f(x) = -x^3 - 2x^2 + 4}$$

75. Use the remainder theorem and synthetic division to determine $f(k)$.

Show your work for credit.

$$k = -2;\, f(x) = 4x^3 - 6x^2 - 4x + 11$$

76. Factor $\mathrm{f(x)}$ into linear factors given that k is a zero of $\mathrm{f(x)}$.

$$f(x) = x^3 - 2x^2 - 36x + 72; k = 6$$

77. Factor $\mathrm{f(x)}$ into linear factors given that k is a zero of $\mathrm{f(x)}$.

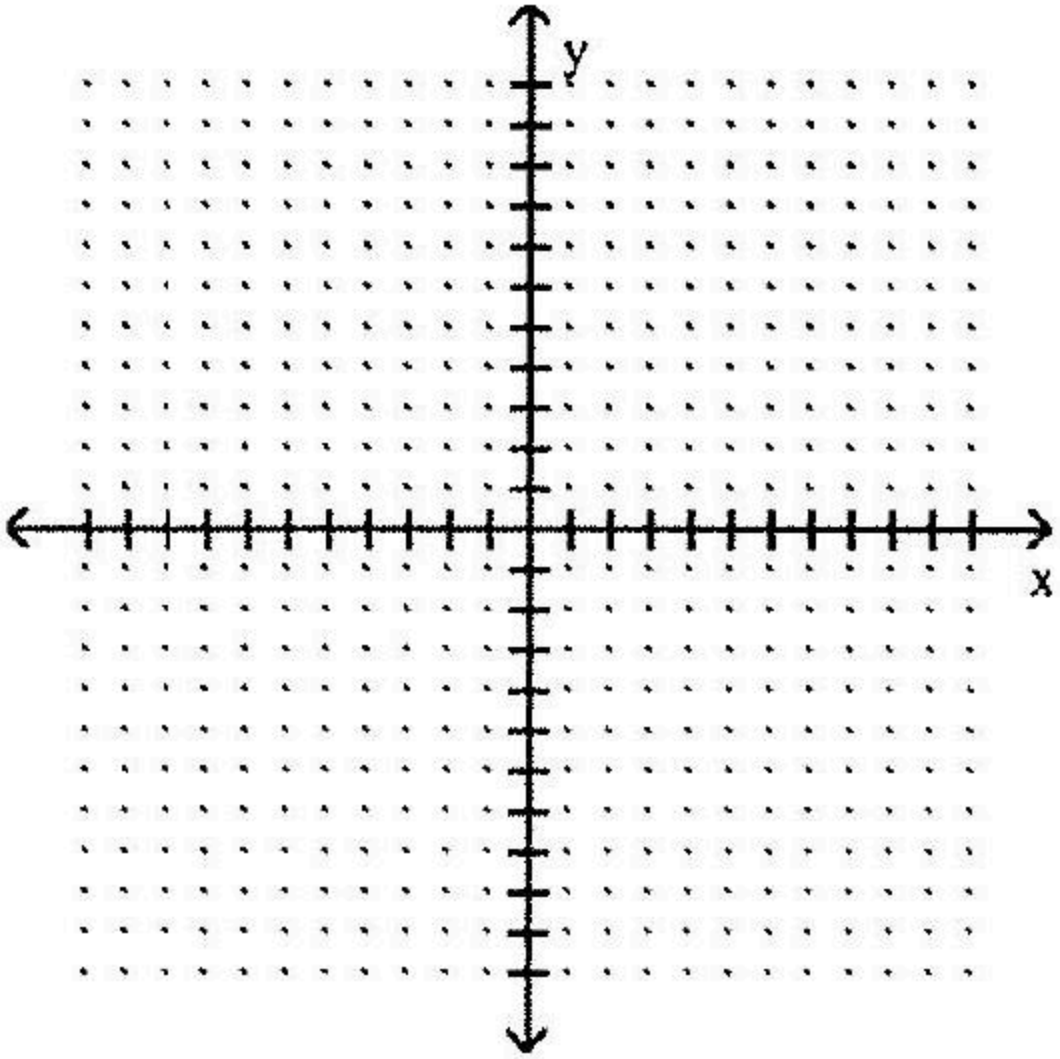
$$f(x) = x^3 - 12x - 16; k = -2(\text{ multiplicity } 2)$$

78. Determine all possible rational zeros for the following polynomial.

$$P(x) = 2x^3 - 5x^2 + 7x - 3$$

79. Determine the zeros of the polynomial function, state the multiplicity of each, and whether the graph touches or crosses the x-axis at that zero. Then graph the function.

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



80) Use Descartes Rule of Signs to determine the number of potential positive and negative zeros. Then determine all zeros (real and complex) of the polynomial function. Provide exact values.

$$f(x) = x^3 - 7x^2 + 15x - 25$$

81. Determine the correct end behavior for the given polynomial function.

Provide your answer in terms of which quadrants the function ends.

$$P(x) = -2x^6 + 9x^5 - x^2 - 7x + 7$$

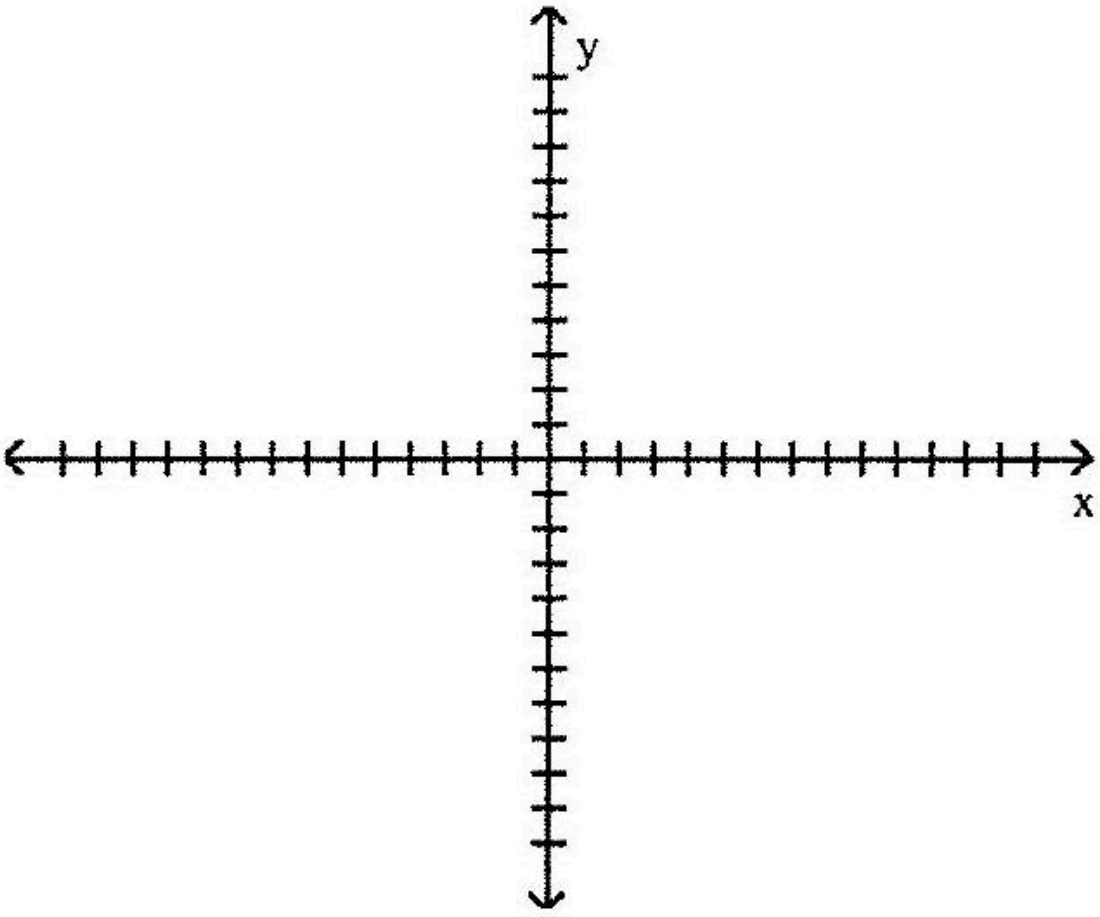
82. Determine the correct end behavior for the given polynomial function.

Provide your answer in terms of which quadrants the function ends.

$$\mathrm{P(x) = 3x^7 + 8x^2 - 3}$$

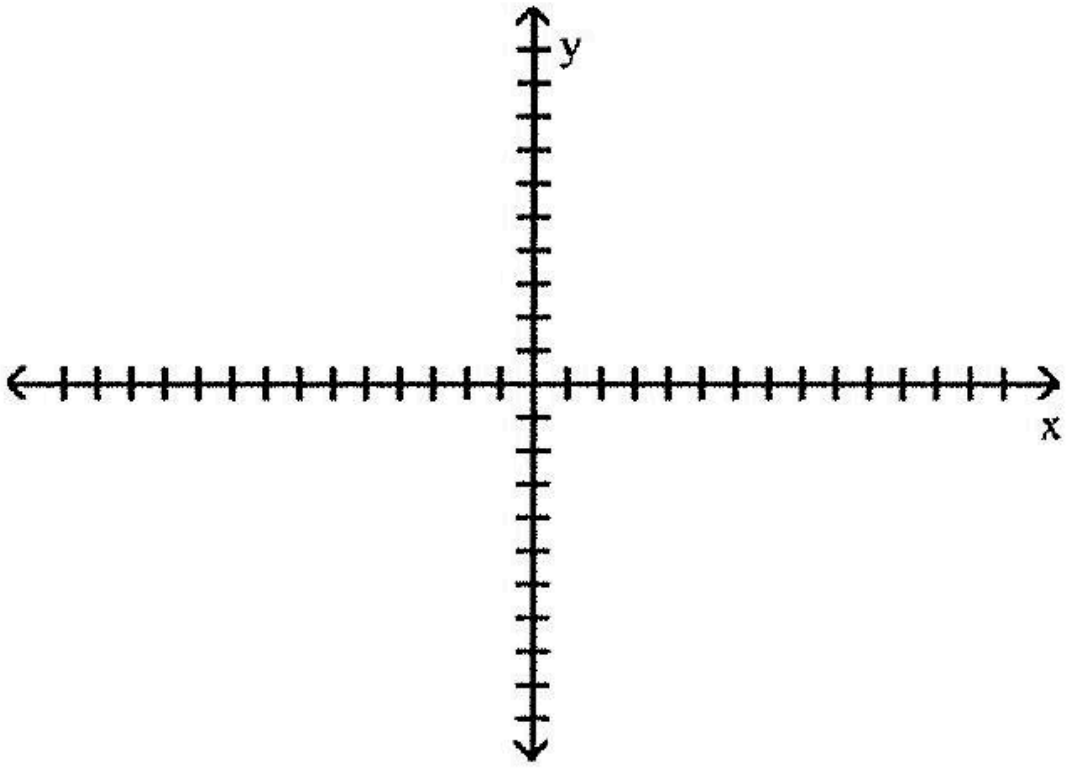
83. Determine the end behavior of the polynomial function (state which quadrants or as rises/falls left/right). Roughly sketch the function using only the end behavior and y-axis intercept.

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



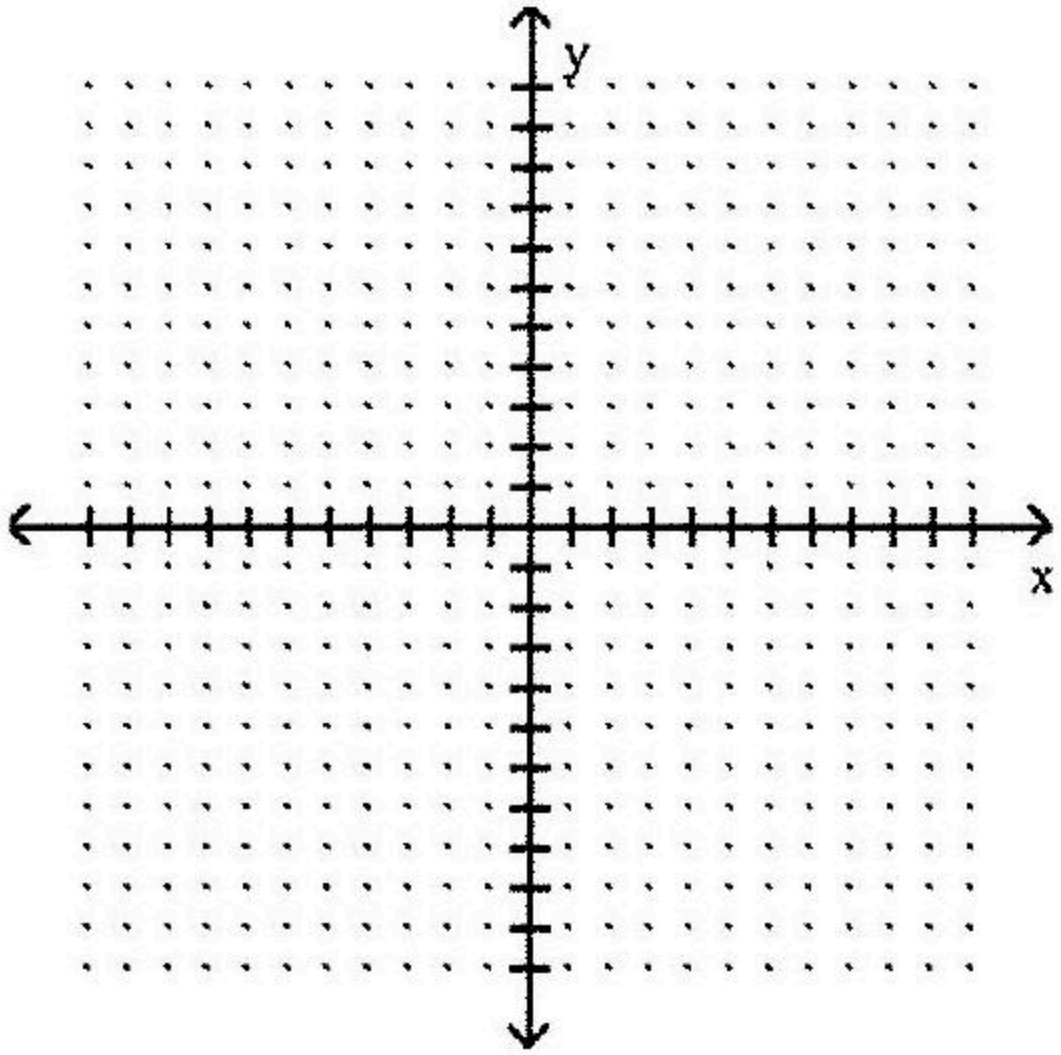
84) Determine the end behavior of the polynomial function (state which quadrants or as rises/falls left/right). Roughly sketch the function using only the end behavior and y-axis intercept.

$$f(x) = 5x^4 + 4x^3 - 5x^2 + 4x - 1$$



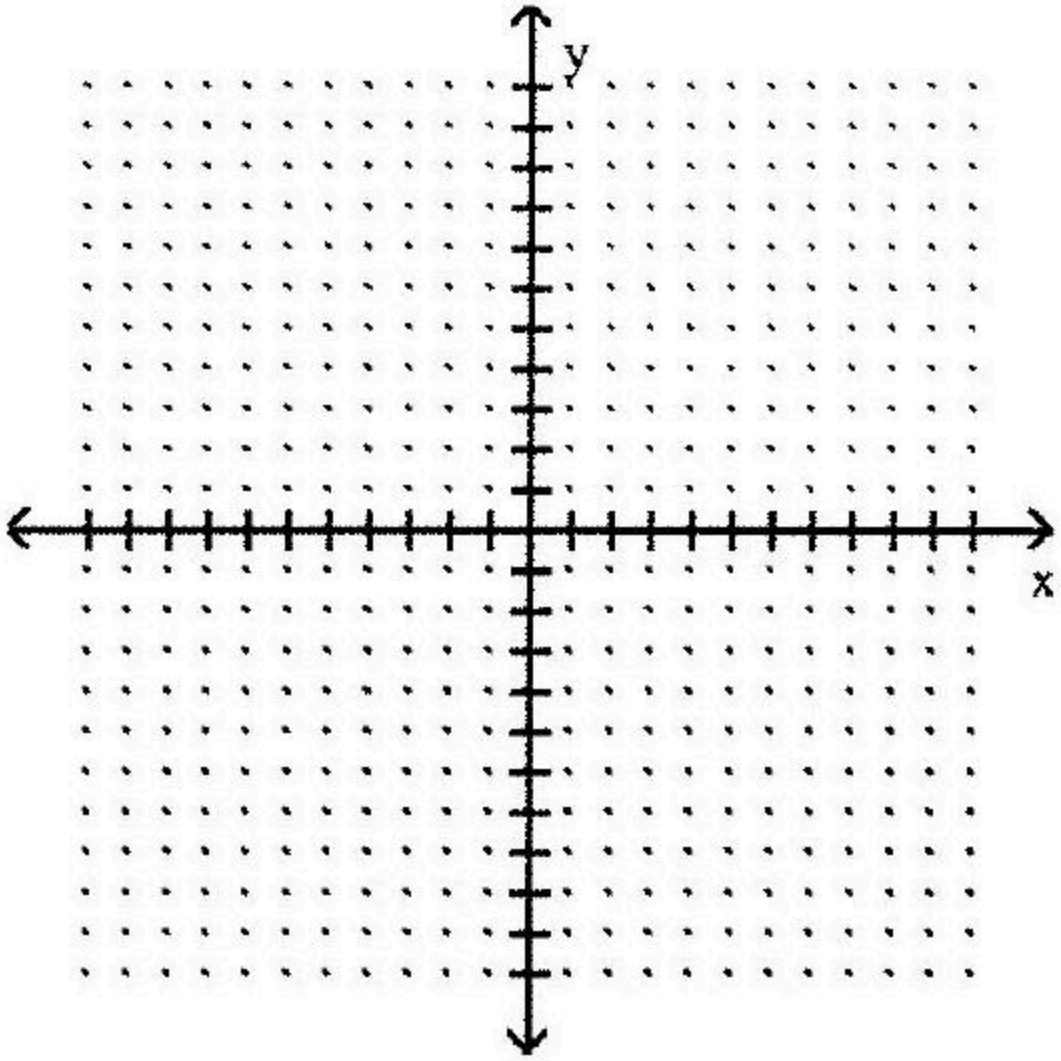
85) Determine the equation of the axis of symmetry, the vertex, y-axis intercept, and x-axis intercepts (as appropriate). Then graph the function and state the domain and range in interval notation.

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



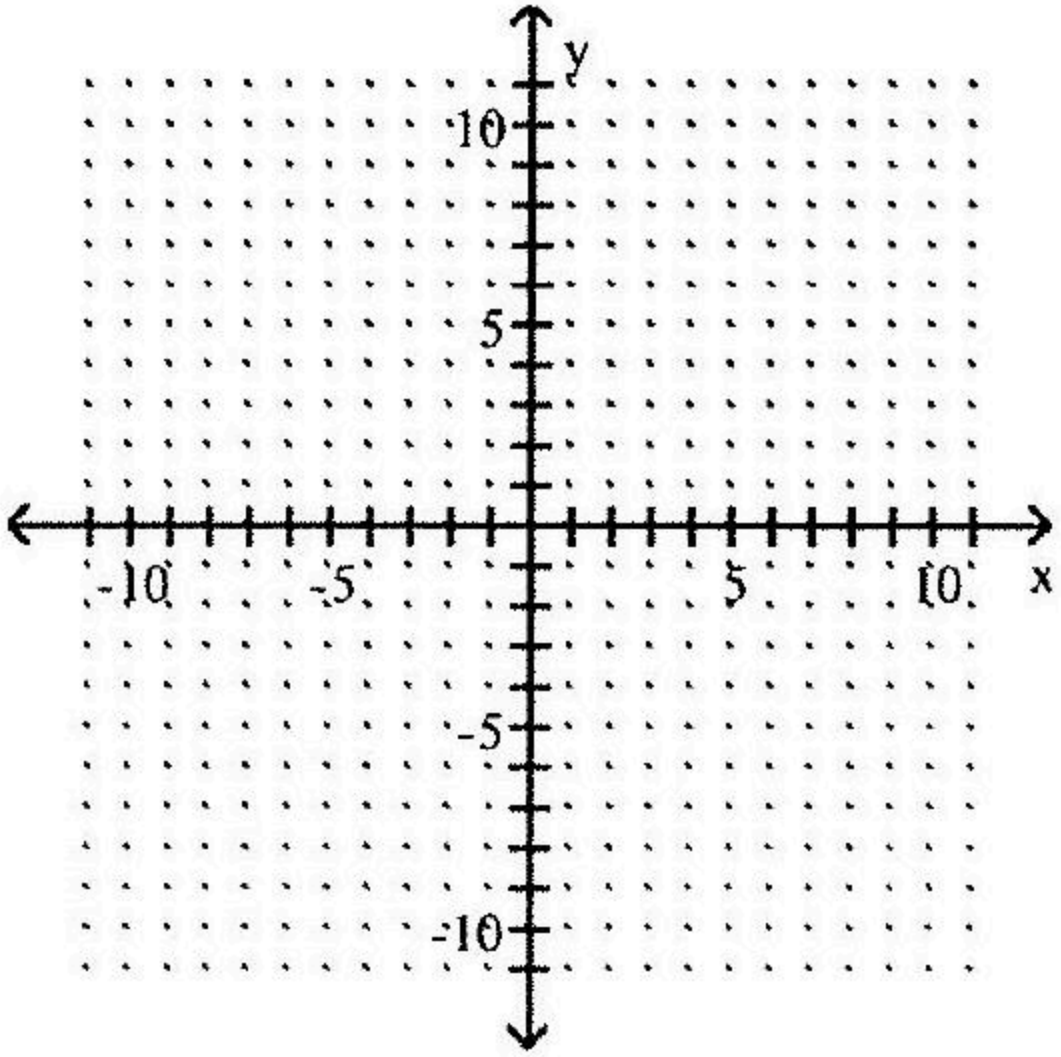
86) Determine the equation of the axis of symmetry, the vertex, y-axis intercept, and x-axis intercepts (as appropriate). Then graph the function and state the domain and range in interval notation.

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



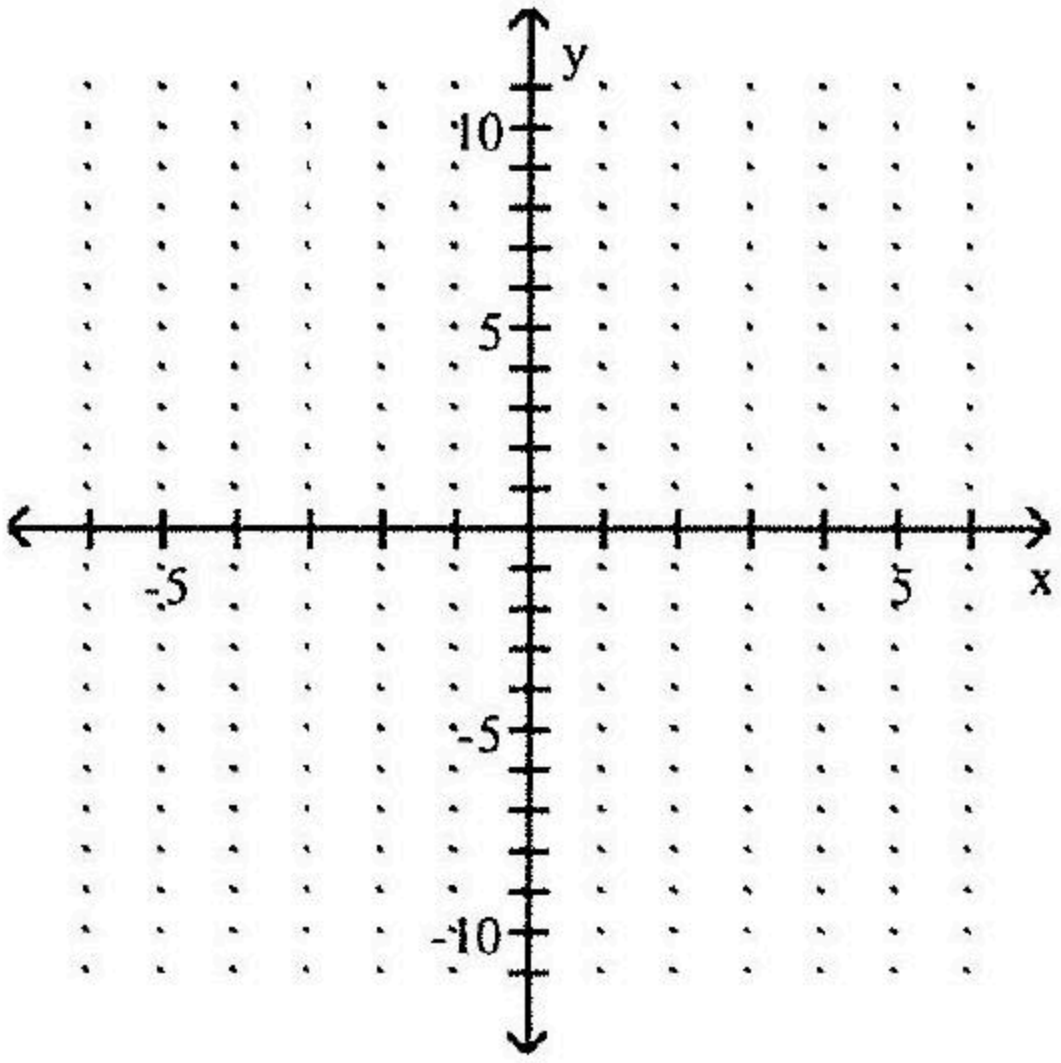
87) Determine the x and y intercepts and sketch the graph of the function.

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



88) Determine the zeros and the y axis intercept. Then graph the function.

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

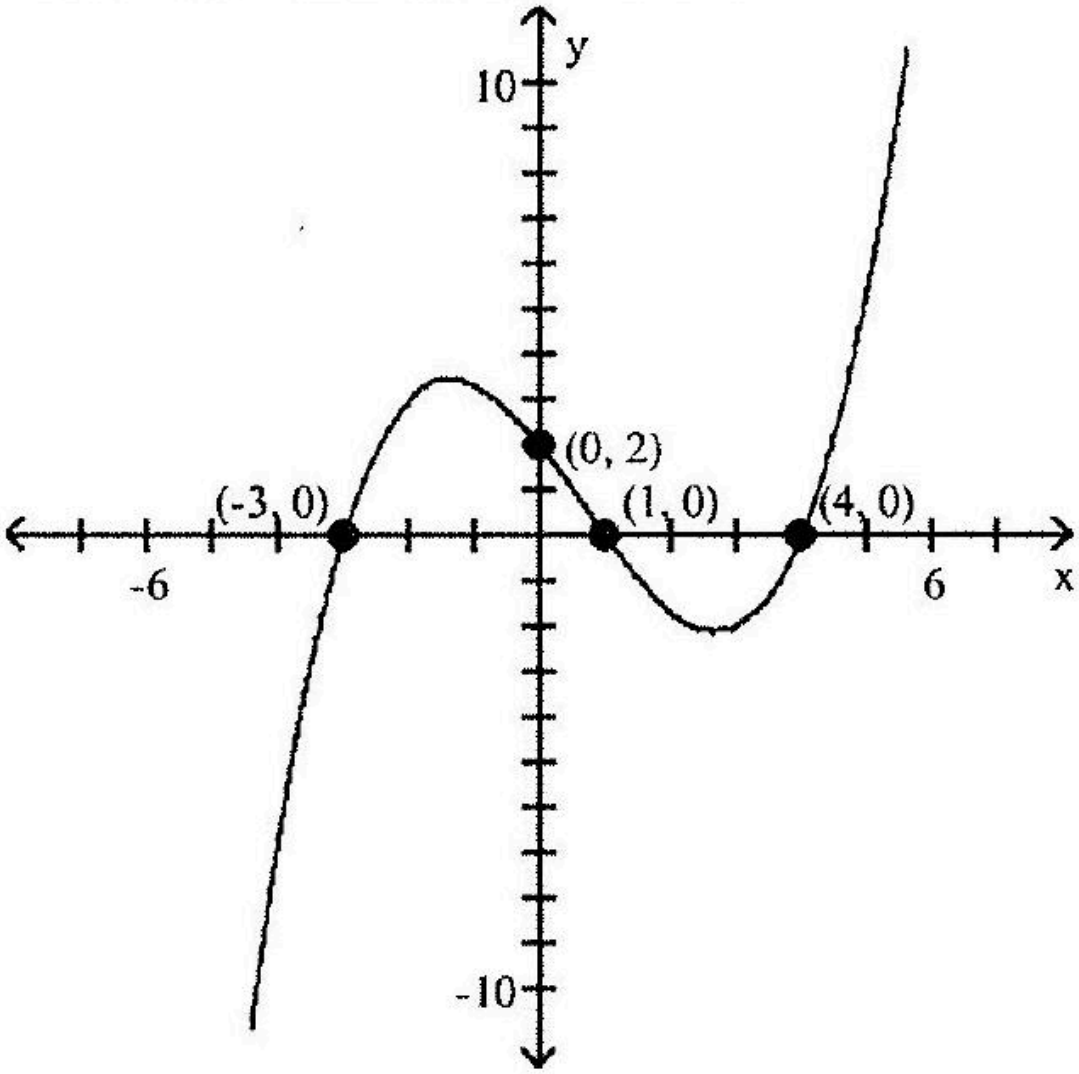


89) Use the intermediate value theorem for polynomials to show that the polynomial function has a real zero between the numbers given.

$$f(x) = 3x^4 - 4x^2 - 1; 1 \text{ and } 2$$

90. Determine a polynomial function $f(x)$ of least possible degree having the graph shown.

Leave in factored form.



91) Provide the equations of all vertical, horizontal, and/or oblique asymptotes.

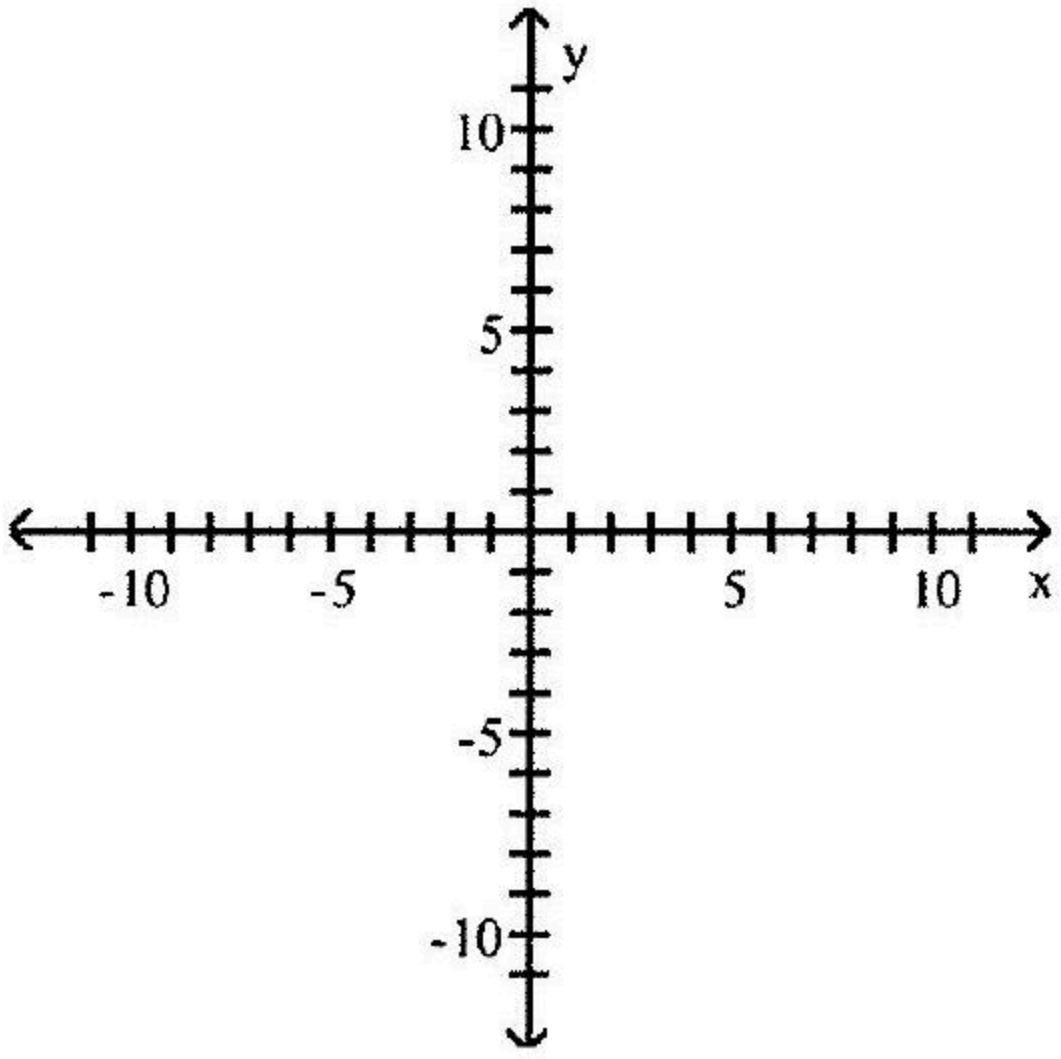
$$g(x) = \frac{x-2}{(x-3)(x+1)}$$

92. Provide the equations of all vertical, horizontal, and/or oblique asymptotes.

$$h(x) = \frac{-9x+5}{-4x+5}$$

93. Provide the equations of all vertical, horizontal, and/or oblique asymptotes and the intercepts (y and x as appropriate). Then sketch the graph of the rational function.

$$f(x) = \frac{3x}{x^2 - 9}$$

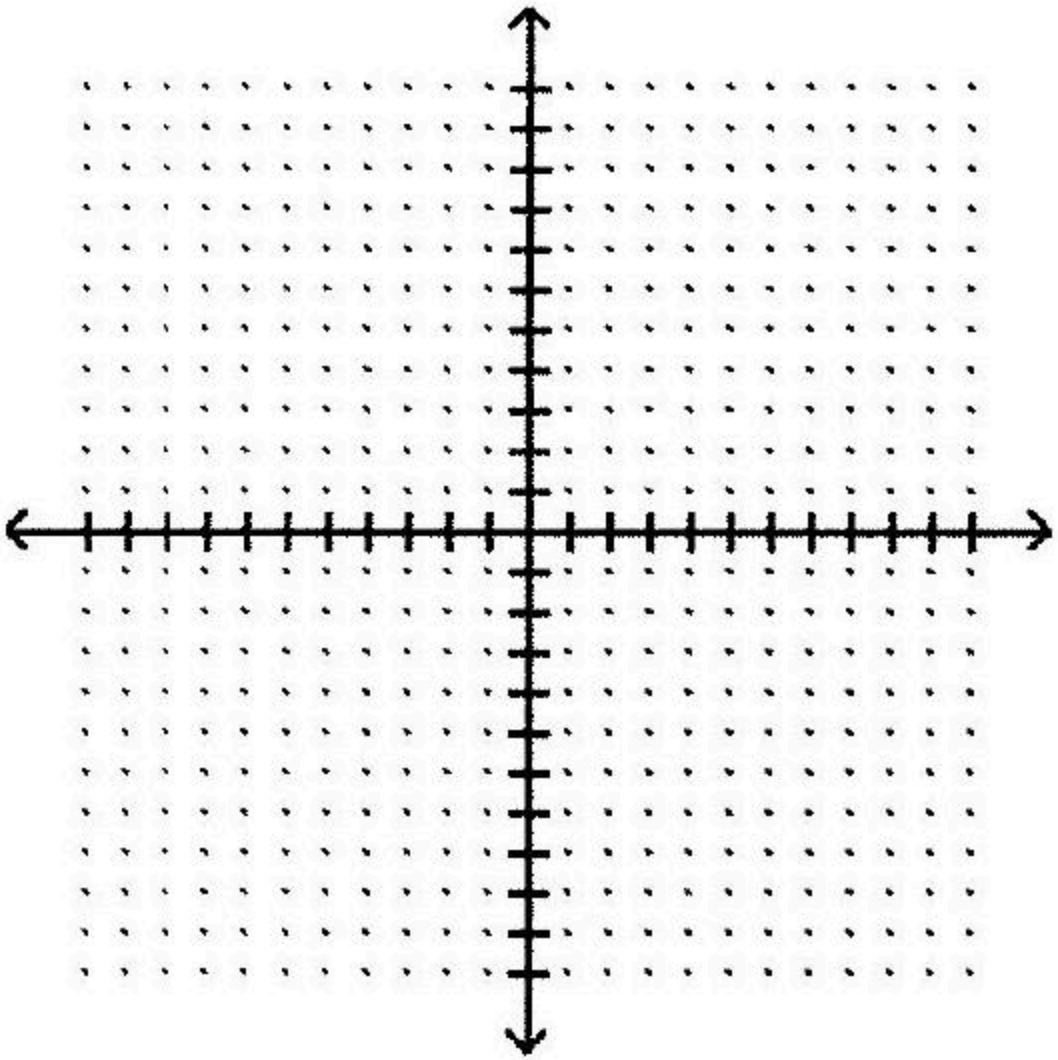


94) Determine a polynomial of degree 3 with real coefficients that satisfies the given conditions.

Zeros of 3, i, -i and $\mathrm{P}(2) = 15$

95) Provide the equations of all vertical, horizontal, and/or oblique asymptotes and the intercepts (y and x as appropriate). Then sketch the graph of the rational function.

$$f(x) = \frac{x^2 - 5x + 8}{x + 7}$$



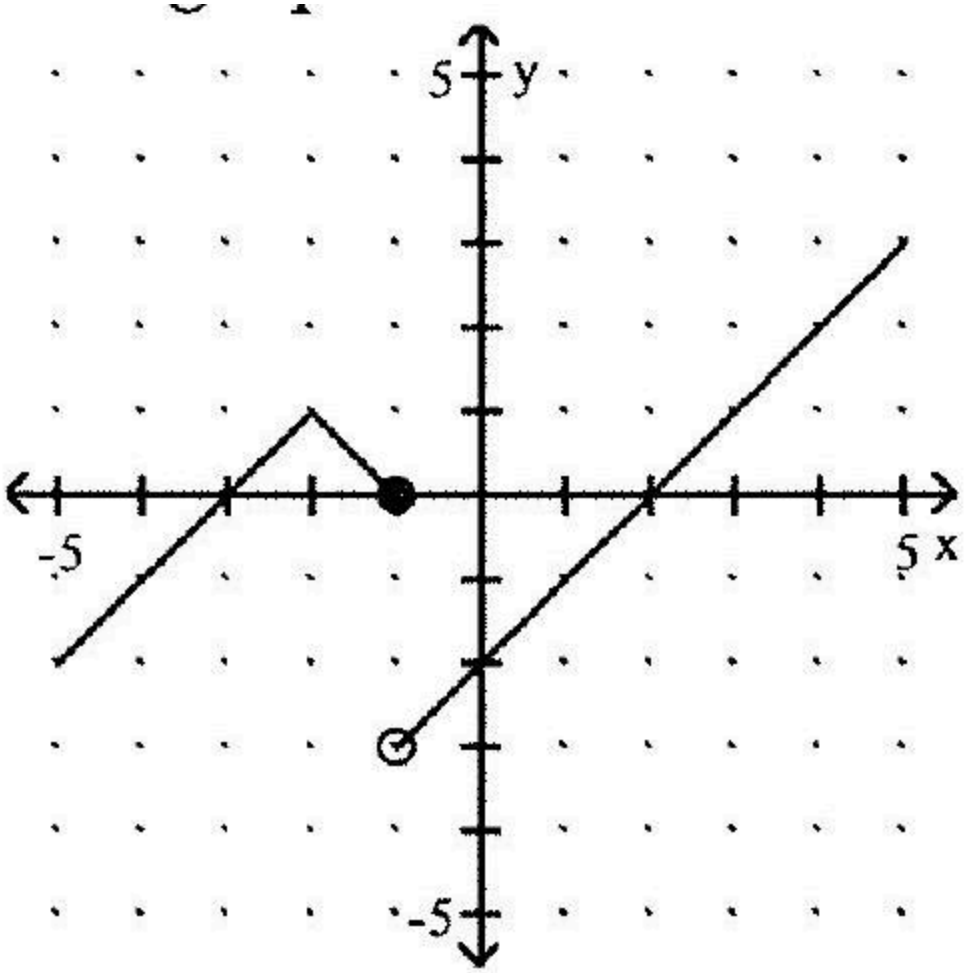
96) Determine $(f-g)(-2)$ when $f(x)=4x^2-2$ and $g(x)=x-3$.
97) Determine $(f+g)(-3)$ when $f(x)=x+2$ and $g(x)=x+4$.
98) Determine $\left(\frac{f}{g}\right)(-5)$ when $f(x)=4x-2$ and $g(x)=5x^2+14x+2$.
99) Determine $(fg)(2)$ when $f(x)=x-6$ and $g(x)=-3x^2+11x-7$.
100) $f(x)=9x-5, g(x)=5x-7$

Determine $(f-g)(x)$.
101) $\mathrm{f(x)=8x+1,\ g(x)=4x-2}$

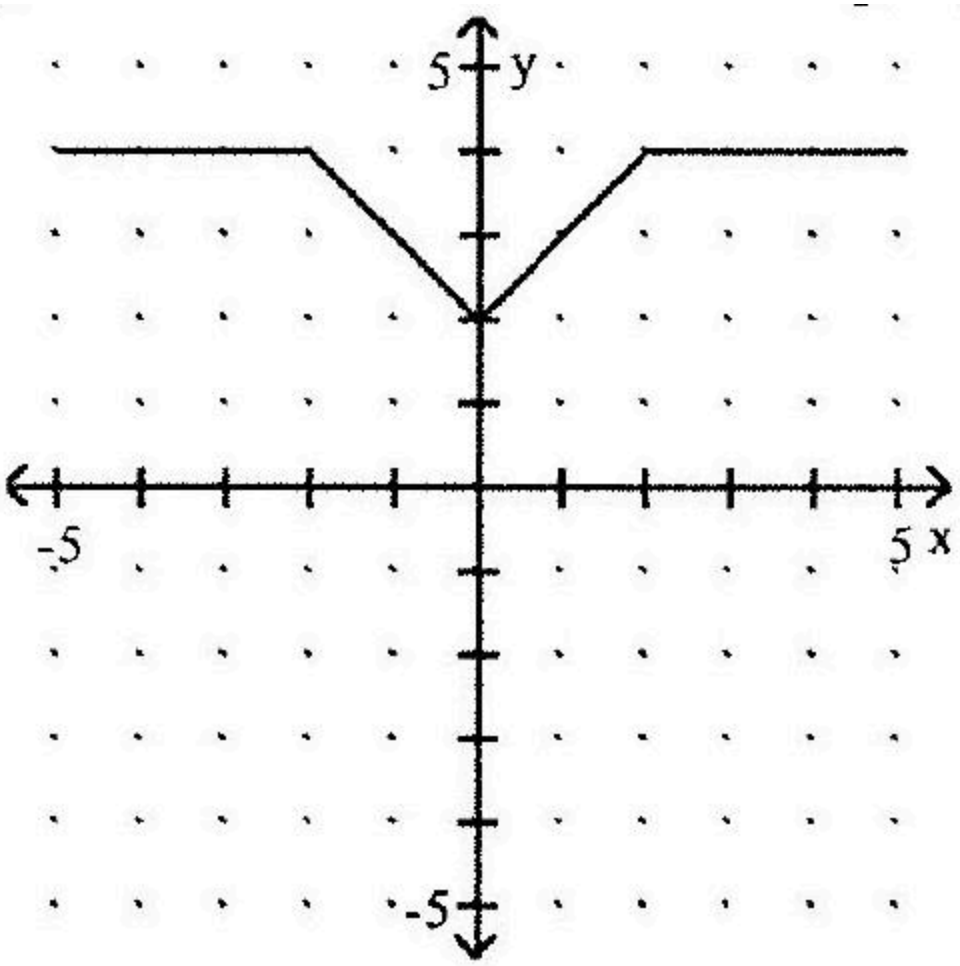
Determine $(\mathrm{fg})(\mathrm{x})$.
102) $f(x)=\sqrt{6x-9}, g(x)=\frac{1}{x}$

Determine $\left(\frac{f}{g}\right)(x)$.

103) The graphs of functions f and g are shown. Use these graphs to Determine $(f+g)(-2)$.



$y = f(x)$



$y = g(x)$

104. Compute and simplify the difference quotient $\frac{f(x+h)-f(x)}{h}, h \neq 0$. when $f(x) = 4x - 15$
105. Compute and simplify the difference quotient $\frac{f(x+h)-f(x)}{h}, h \neq 0$. when $f(x) = 2x^2 + 7x$
106. Using the given tables, determine ($g \circ f$) (2)

x	2	5	3	6
f(x)	3	4	7	9

x	4	6	2	3
g(x)	7	3	6	5

107. Determine $(g \circ f)(13)$ when $f(x) = \frac{x-3}{2}$ and $g(x) = 3x + 1$.

108. Determine $(f \circ g)(x)$ when $f(x) = 7x + 12$, and $g(x) = 3x - 1$
109. If the function is one-to-one, find its inverse. If not, write "not one-to-one."

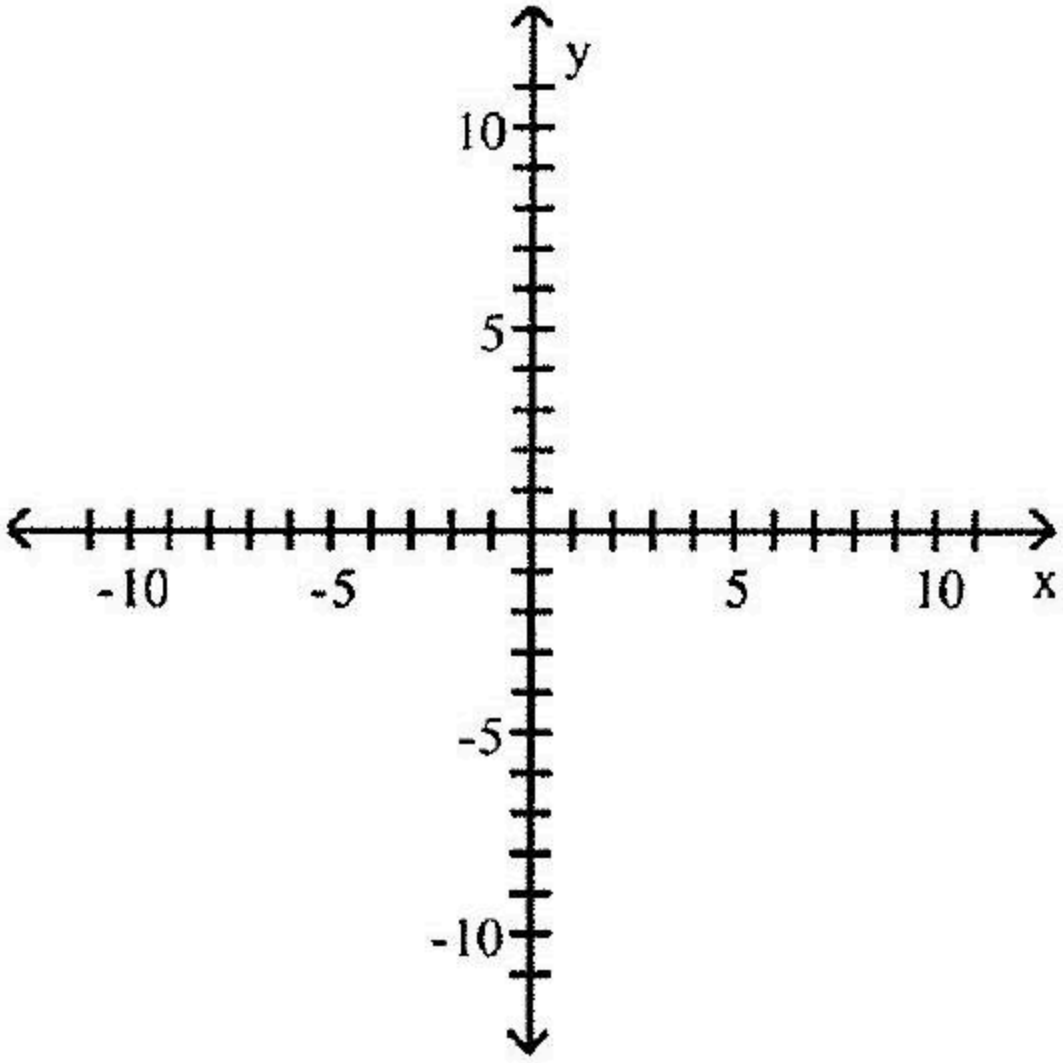
$$f(x) = 2x + 3$$

110. If the function is one-to-one, find its inverse. If not, write "not one-to-one."

$$f(x) = 6x^2 - 9, x \geq 0$$

111. For the function as defined that is one-to-one, graph f and f^{-1} on the same axes.

$$f(x) = \sqrt{x + 4}$$



112) Solve the system by substitution.

$$\begin{aligned} x + 7y &= 15 \\ 2x + 7y &= 9 \end{aligned}$$

113. Solve the system by substitution.

$$\begin{cases} 3x + y = 13 \\ 2x - 7y = 24 \end{cases}$$

114. Solve the system of equations by elimination.

$$\begin{aligned} -7x - 6y &= -13 \\ -3x + 3y &= -39 \end{aligned}$$

115. Solve the system of equations by elimination.

$$\begin{cases} \frac{1}{5}x + \frac{1}{2}y = \frac{1}{2} \\ 2x + 2y = 14 \end{cases}$$

116. Solve the system of equations.

$$\begin{cases} 4x - 2y = 10 \\ 8x - 4y = 50 \end{cases}$$

117. Solve the system of equations.

$$\begin{cases} 4x + y = 2 \\ -16x - 4y = -8 \end{cases}$$

118. Determine the value of the determinant.

$$\begin{vmatrix} 5 & 3 \\ 6 & 4 \end{vmatrix}$$

119. Use Cramer's rule to solve the system of equations.

If $D = 0$, use another method to determine the solution set.

$$x - 3y = 21$$
$$-3x - 4y = 15$$

120. Use Cramer's rule to solve the system of equations.

If $\mathrm{D} = 0$, use another method to determine the solution set.

$$x + y = 1$$
$$x + y = 5$$

121. Use Cramer's rule to solve the system of equations.

If $\mathrm{D} = 0$, use another method to determine the solution set.

$$x + y = 4$$
$$5x + 5y = 20$$

122. Perform the matrix operation or operations or state if not possible.

$$\begin{bmatrix} -1 & 1 \\ 2 & 5 \end{bmatrix} + \begin{bmatrix} 6 & 2 \\ 5 & -2 \end{bmatrix}$$

123. Perform the matrix operation or operations or state if not possible.

$$\begin{bmatrix} 4 & 4 \end{bmatrix} + \begin{bmatrix} 1 \\ 9 \end{bmatrix}$$

124. Perform the matrix operation or operations or state if not possible.

$$\begin{bmatrix} -7 & -7 \\ 4 & 8 \end{bmatrix} + \begin{bmatrix} 1 & -4 \\ -4 & -9 \end{bmatrix} - \begin{bmatrix} 6 & 9 \\ -4 & -4 \end{bmatrix}$$

125. Perform the matrix operation or operations or state if not possible.

$$\text{Let } \mathrm{A} = \begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix} \text{ and } \mathrm{B} = \begin{bmatrix} 0 & 4 \\ -1 & 6 \end{bmatrix}. \text{ Find } 4\,\mathrm{A} + \mathrm{B}$$

126. Perform the matrix operation or operations or state if not possible.

$$\begin{bmatrix} -1 & 3 \\ 5 & 2 \end{bmatrix} \begin{bmatrix} 0 & -2 & 7 \\ 1 & -3 & 2 \end{bmatrix}$$

127. Perform the matrix operation or operations or state if not possible.

Given $\mathrm{A} = \begin{bmatrix} 1 & -2 \\ 4 & 3 \end{bmatrix}$ and $\mathrm{B} = \begin{bmatrix} 0 & -1 \\ 5 & 4 \end{bmatrix}$, Determine both AB and BA

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