EVALUATING FUNCTIONS: Evaluate each function at the specified value of the independent variable and simplify.

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

a. $f(-3) = 2(-3)^2+3(-3)-5$

$2(9)-9-5 = \boxed{4}$

b. $-f(x)$ $-(2x^2+3x-5)$

$\boxed{-2x^2-3x+5}$

c. $f(2x) = 2(2x)^2+3(2x)-5$

$2 \cdot 4x^2+6x-5$

$\boxed{8x^2+6x-5}$

2. $f(x) = |x| - 4$

a. $f(-x) = \boxed{|x|-4}$

b. $f(x-2)$ $\boxed{|x-2|-4}$

c. $f(3x)$ $\boxed{|3x|-4}$

3. $f(x) = \sqrt{x^2 - 2x}$

a. $f(-3) = \sqrt{(-3)^2-2(-3)}$

$\sqrt{9+6} = \boxed{\sqrt{15}}$

b. $f(-x)$ $\sqrt{(-x)^2-2(-x)} = \boxed{\sqrt{x^2+2x}}$

c. $-f(x)$ $\boxed{-\sqrt{x^2-2x}}$

4. $f(x) = x^2 + 7$

$\frac{f(x+h)-f(x)}{h}$, $h \neq 0$

$\frac{((x+h)^2+7)-(x^2+7)}{h}$

$\frac{x^2+2xh+h^2+7-x^2-7}{h}$

$\frac{h(2x+h)}{h}$

5. If $f(x) = 3x^3 + Bx^2 + 5x - 1$ and $f(-1) = -13$, what is the value of B?

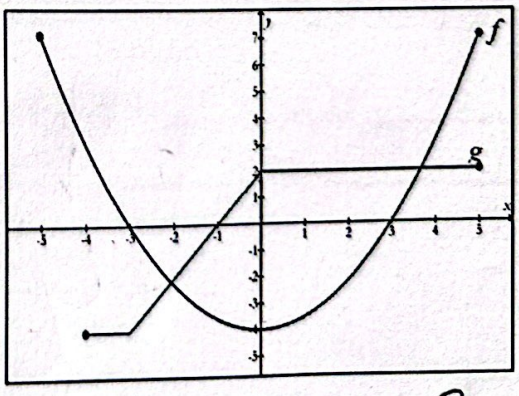
$-13 = 3(-1)^3+B(-1)^2+5(-1)-1$

$-13 = -3+B-5-1$

$-13 = B-9$

$\boxed{-4 = B}$

6. Use the graph to estimate the value:



a) $f(-3) =$ 0 b) $g(0) =$ 2

Directions: Write each inequality in interval notation.

7. $x > 5$ $(5, \infty)$

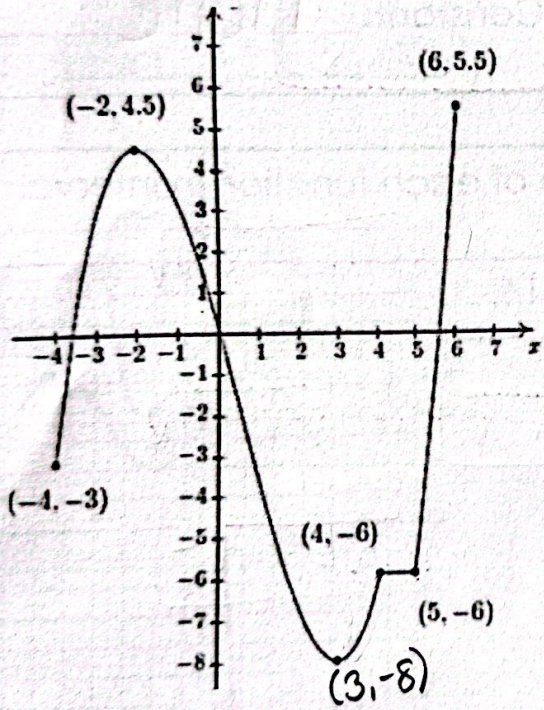
8. $x \leq -3$ $(-\infty, -3]$

9. $x > 8$ or $x \leq 3$ $(-\infty, 3]$ $(8, \infty)$

10. $-1 \leq x < 7$ $[-1, 7)$

Directions: Determine the interval(s) where the function is increasing, decreasing, or constant.

11.

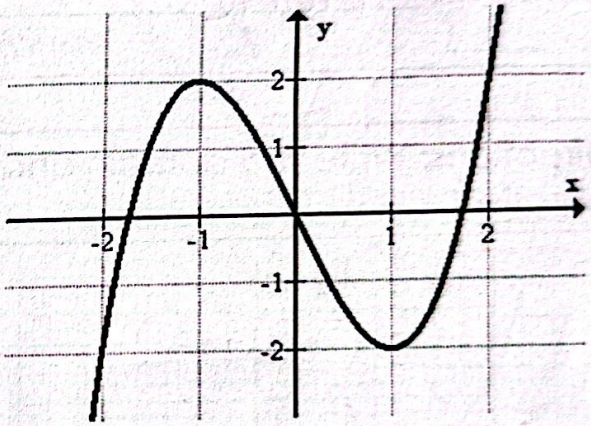


Increasing: $(-4, -2)$ $(3, 4)$ $(5, 6)$

Decreasing: $(-2, 3)$

Constant: $(4, 5)$

12.

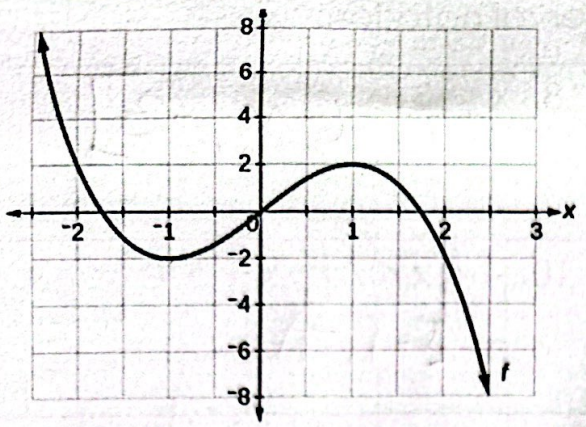


Increasing: $(-\infty, -1)$ $(1, \infty)$

Decreasing: $(-1, 1)$

Constant: none

13.

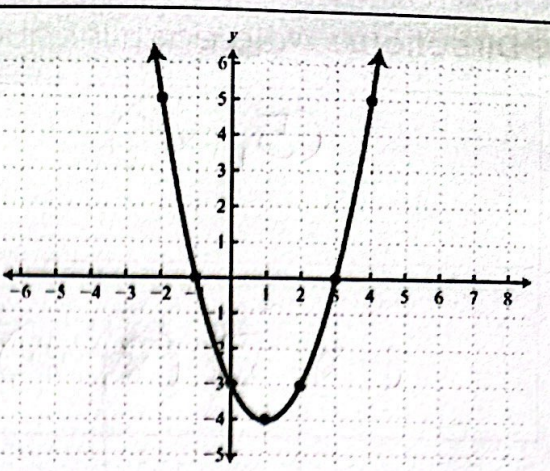


Increasing: $(-1, 1)$

Decreasing: $(-\infty, -1)(1, \infty)$

Constant: none

14.



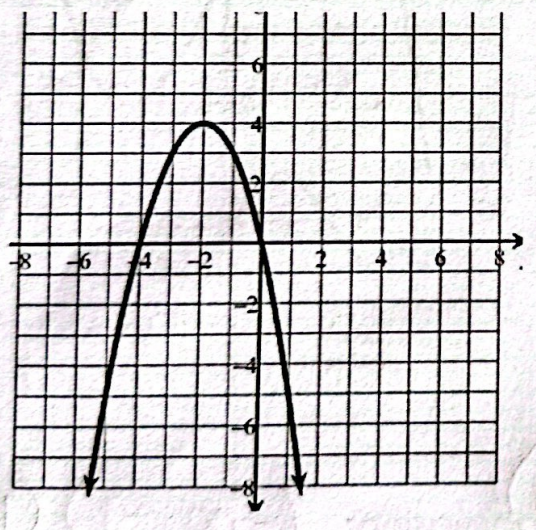
Increasing: $(1, \infty)$

Decreasing: $(-\infty, 1)$

Constant: none

Directions: Write the domain and range of each function in interval notation.

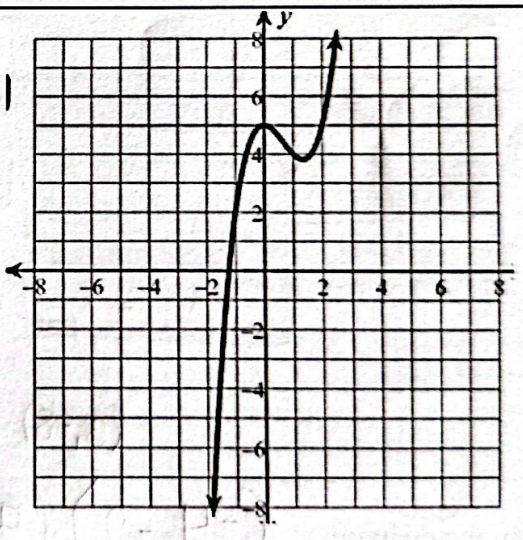
15.



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

Range: $(-\infty, 4]$

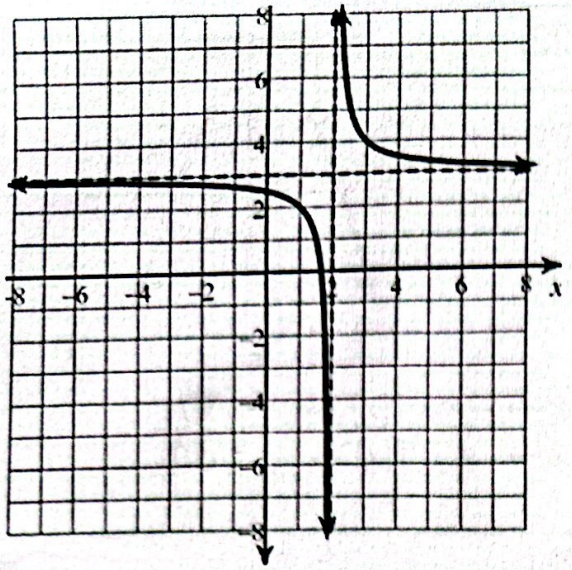
16.



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

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

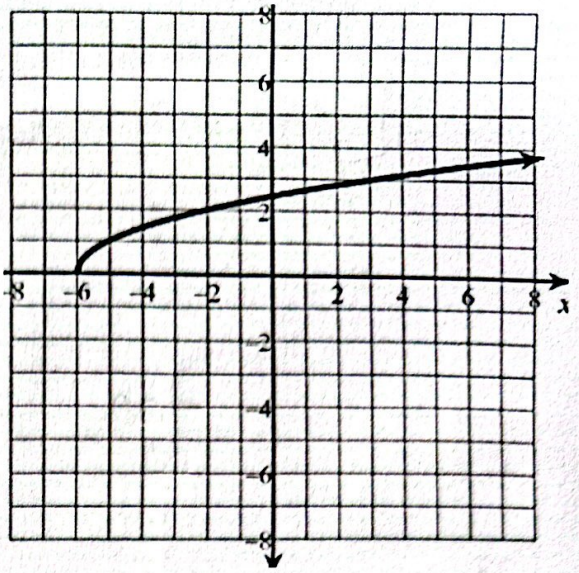
17.



Domain: $(-\infty, 2)(2, \infty)$

Range: $(-\infty, 3)(3, \infty)$

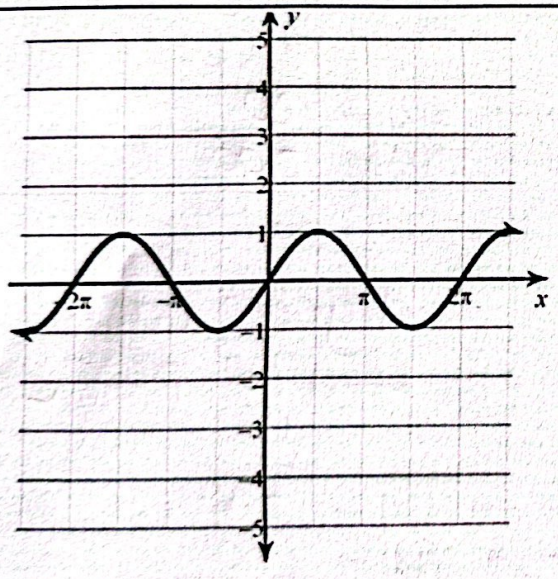
18.



Domain: $[-6, \infty)$

Range: $[0, \infty)$

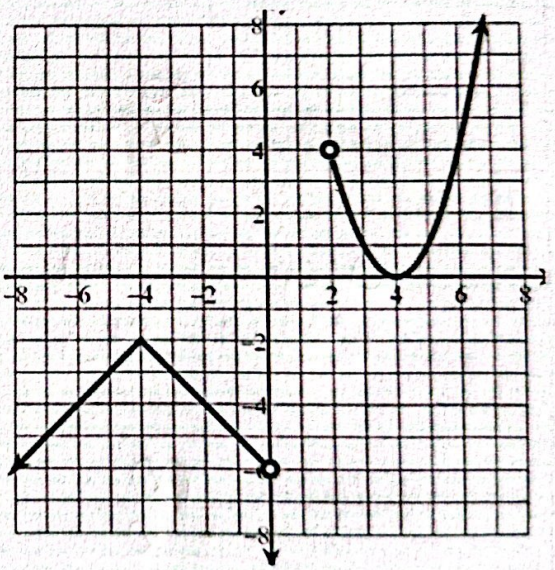
19.



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

Range: $[-1, 1]$

20.

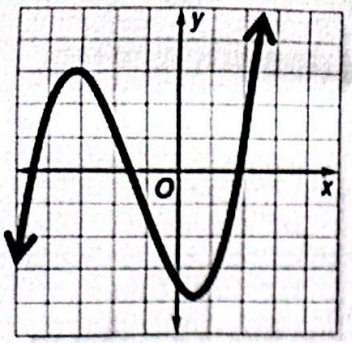


Domain: $(-\infty, 0)(2, \infty)$

Range: $(-\infty, -2]\ [0, \infty)$

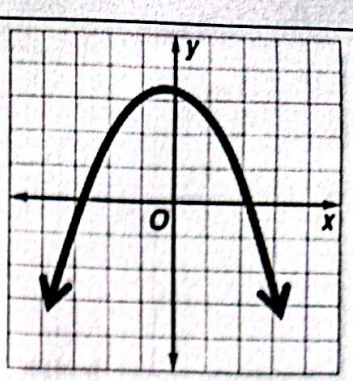
Directions: State the end behavior of for each.

21.



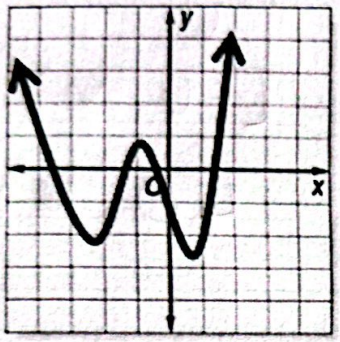
$x \to -\infty$, $f(x) \to$ $-\infty$
$x \to \infty$, $f(x) \to$ ∞

22.



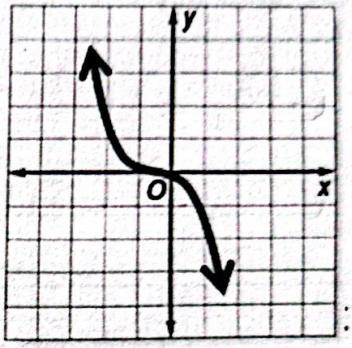
$x \to -\infty$, $f(x) \to$ $-\infty$
$x \to \infty$, $f(x) \to$ $-\infty$

23.



$x \to -\infty$, $f(x) \to$ ∞
$x \to \infty$, $f(x) \to$ ∞

24.



$x \to -\infty$, $f(x) \to$ ∞
$x \to \infty$, $f(x) \to$ $-\infty$

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

degree: odd ↑
Lead co. neg ↓

$x \to -\infty$, $f(x) \to$ ∞
$x \to \infty$, $f(x) \to$ $-\infty$

26. $f(x) = 2x^3 - 5x$

degree: odd ↗
Lead co: pos ↙

$x \to -\infty$, $f(x) \to$ $-\infty$
$x \to \infty$, $f(x) \to$ ∞

27. $f(x) = -5x^4 - x + 7$

degree: even
Lead co: neg ↙ ↘

$x \to -\infty$, $f(x) \to$ $-\infty$
$x \to \infty$, $f(x) \to$ $-\infty$

28. $f(x) = 5x^2 - 4x - 8$

degree: even
Lead co: pos ↑ ↑

$x \to -\infty$, $f(x) \to$ ∞
$x \to \infty$, $f(x) \to$ ∞

Directions: Factor each polynomial completely.

29. $36x^4 - 18x^3 - 9x^2$

$9x^2(4x^2 - 2x - 1)$

30. $x^2 + x - 72$

$(x+9)(x-8)$

31. $5x^2 - 18x + 9$

$+45$

$5x^2 - 15x - 3x + 9$

$5x(x-3) - 3(x-3)$

$(5x-3)(x-3)$

32. $3x^2 + 2x - 5$

-15

$3x^2 - 3x + 5x - 5$

$3x(x-1) + 5(x-1)$

$(3x+5)(x-1)$

33. $6x^2 - 7x - 3$

-18

$6x^2 - 9x + 2x - 3$

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

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

34. $81 - 4x^2$

$(9+2x)(9-2x)$

35. $x^3 + 5x^2 - 9x - 45$

$x^2(x+5) - 9(x+5)$

$(x^2-9)(x+5)$

$(x+3)(x-3)(x+5)$

36. $42mc + 36md - 7n^2c - 6n^2d$

$6m(7c+6d) - n^2(7c+6d)$

$(6m - n^2)(7c+6d)$

37. $x^4 - 2x^2 + 1$

$(x^2-1)(x^2-1)$

$(x+1)(x-1)(x+1)(x-1)$

$(x+1)^2(x-1)^2$

38. $x^4 - 1$

$(x^2+1)(x^2-1)$

$(x^2+1)(x+1)(x-1)$

39. $8u^3 + 1$

$a = 2u \quad b = 1$

$(2u+1)(4u^2 - 2u + 1)$

40. $27x^3 - 125y^3$

$a = 3x \quad b = 5y$

$(3x-5y)(9x^2 + 15xy + 25y$

41. $x^2 + 16$

prime

42. $16x^2 - 40x + 25$

$(4x-5)(4x-5)$

43. $3x^4 - 9x^3 - 30x^2$

$3x^2(x^2 - 3x - 10)$

$3x^2(x-5)(x+2)$

44. $15x^2 - x - 2$

-30

$15x^2 + 5x - 6x - 2$

$5x(3x+1) - 2(3x+1)$

$(5x-2)(3x+1)$

Directions: Simplify each rational expression,

45. $\frac{x^2+x-20}{x^2+2x-15}$

$\frac{(x+5)(x-4)}{(x+5)(x-3)}$

$\frac{x-4}{x-3}$

46. $\frac{4-x^2}{x^2+x-6}$

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

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

47. *State the zeros and the domain of*:

$f(x) = \frac{x-2}{x^2+2x-35}$

$\frac{x-2}{(x+7)(x-5)}$

$x \neq -7$ or 5

domain: $(-\infty, -7)(-7, 5)(5, \infty)$

zeros: (x int) $0 = x-2$ $(2, 0)$

48. For which values of x is the following expression undefined?

$f(x) = \frac{5+x}{25-x^2}$ $\frac{5+x}{(5-x)(5+x)}$

and $x = \pm 5$

49. $\frac{3x^2+7x-6}{9x^2-4} \cdot \frac{15x^2+4x-4}{9-x^2}$

$3x^2+7x-6$ (-18)

$3x^2+9x-2x-6$

$3x(x+3)-2(x+3)$

$(3x-2)(x+3)$

$15x^2+4x-4$ (-60)

$2+10x-6x-4$

$2(x^2-1)+5x(x^2+2)$

$\frac{(3x-2)(x+3)}{(3x+2)(3x-2)} \cdot \frac{(3x+2)(5x-2)}{(3-x)(3+x)}$

$\frac{5x-2}{3-x}$

50. $\frac{4y^2-9}{2y^2+9y-18} \div \frac{2y^2+y-3}{y^2+5y-6}$ flip!

$\frac{(2y+3)(2y-3)}{(y+6)(2y-3)} \cdot \frac{(y+6)(y-1)}{(y-1)(2y+3)}$

1

51. $\frac{\frac{5x}{x+1}}{\frac{5x^2+10}{x^2-1}}$ LCD: $5x(x^2+2)$

$5x(x^2+2)$

$5(x^2+2)$

$\frac{(x^2-1)(x^2+2)}{x(x+1)}$

$\frac{(x+1)(x-1)(x^2+2)}{x(x+1)}$

$\frac{(x-1)(x^2+2)}{x}$

52. $\frac{\frac{3}{x+1} - \frac{4}{x}}{\frac{4}{(x+1)} + \frac{3}{x}}$ LCD: $x(x+1)$

$x(x+1)$ $x(x+1)$

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

$\frac{-x-4}{7x+3}$

Directions: Simplify the following expressions; assume no variable is equal to 0.

53. $(2x^4)^{-3}$

$2^{-3}x^{-12} = \frac{1}{8x^{12}}$

54. $\frac{5x^3y^9}{30x^4y^{-2}} = \frac{1y^{11}}{6x}$

55. $\frac{xy^9}{2y^2} \cdot \frac{-7y}{21x^{-5}} = \frac{-1x^6y^8}{6}$

56. $\left(\frac{2a^3b}{a^2b^2}\right)^{-4} = \left(\frac{2a}{b}\right)^{-4} = \frac{2^{-4}a^{-4}}{b^{-4}} = \frac{b^4}{16a^4}$

57. $\left(\frac{5x^7}{x^7y^6}\right)^0$ 1

58. $a^2 \cdot a^{x+7} \cdot a^{x-3}$

$2+x+7+x-3$

a^{2x+6}

Directions: Simplify each of the following. SHOW HOW TO REWRITE IT AS A RADICAL!

59. $\left(\frac{121}{100}\right)^{\frac{1}{2}}$ $\sqrt{\frac{121}{100}} = \frac{11}{10}$

60. $(-32)^{\frac{4}{5}}$ $\sqrt[5]{(-32)^4}$ $(-2)^4 = 16$

61. $(-81)^{\frac{3}{4}}$ $\sqrt[4]{(-81)^3}$ Not real

Directions: Rewrite as a fractional exponent.

62. $\sqrt{x}$ $x^{1/2}$

63. $\sqrt[4]{x^3}$ $x^{3/4}$

64. $\sqrt[5]{x}$ $x^{1/5}$

Directions: Perform the indicated operations. Write answers using only positive exponents.

65. $(4m^{\frac{2}{3}})(-3m^{\frac{5}{3}})$

$-12m^{\frac{7}{3}}$

66. $(2y^{\frac{3}{4}}z)(3y^{-2}y^{-\frac{1}{3}})$

$6y^{-5/4}z^{2/3}$

$\frac{6z^{2/3}}{y^{5/4}}$

67. $\left(\frac{x^4y^3z}{16x^{-16}yz^5}\right)^{\frac{1}{2}}$

$\left(\frac{x^{20}y^2}{16z^4}\right)^{1/2} = \frac{x^{10}y}{4z^2}$

68. $\left(\frac{x^{\frac{3}{2}}}{x^{\frac{1}{2}}}\right)^2$ $\frac{x^3}{x} = x^2$

69. $2\sqrt{12} - 3\sqrt{27} + \frac{1}{2}\sqrt{48} - 7\sqrt{8}$

$\sqrt{4}\sqrt{3}$ $\sqrt{9}\sqrt{3}$ $\sqrt{16}\sqrt{3}$ $\sqrt{4}\sqrt{2}$

$4\sqrt{3} - 9\sqrt{3} + 2\sqrt{3} - 14\sqrt{2}$

$-3\sqrt{3} - 14\sqrt{2}$

70. $\frac{1}{3}\sqrt[3]{16} + \frac{3}{4}\sqrt[3]{54} - \frac{2}{5}\sqrt[3]{250}$

$\sqrt[3]{8}\sqrt[3]{2}$ $\sqrt[3]{27}\sqrt[3]{2}$ $\sqrt[3]{125}\sqrt[3]{2}$

$\frac{2}{3}\sqrt[3]{2} + \frac{9}{4}\sqrt[3]{2} - 2\sqrt[3]{2}$

$\frac{11}{12}\sqrt[3]{2}$

Directions: Solve the equation by factoring.

71. $27x^2 + 18x = 0$

$9x(3x + 2) = 0$

$x = 0$ $x = -2/3$

72. $5x^2 - 32x - 21 = 0$

-105

$(5x^2 - 35x) + 3x - 21 = 0$

$5x(x - 7) + 3(x - 7) = 0$

$(5x + 3)(x - 7) = 0$

$x = -3/5$ $x = 7$

73. $x^2 + 3x = 10$

$x^2 + 3x - 10 = 0$

$(x + 5)(x - 2) = 0$

$x = -5$ $x = 2$

74. $2x^2 + 20x + 12 = 5x - x^2$

$+x^2 - 5x$ $-5x + x^2$

$3x^2 + 15x + 12 = 0$

$3(x^2 + 5x + 4) = 0$

$3(x + 4)(x + 1) = 0$

$3 \neq 0$ $x = -4$ $x = -1$

Directions: Solve the equation by using the quadratic formula. Write your answer in simplest radical form.

75. $5x^2 - 3x - 6 = 0$

$a = 5$ $b = -3$ $c = -6$

$x = \frac{3 \pm \sqrt{(-3)^2 - 4(5)(-6)}}{2(5)}$

$x = \frac{3 \pm \sqrt{129}}{10}$

76. $2x^2 - 14x + 40 = 3x^2 - 16x + 32$

$-2x^2 + 14x - 40$ $-2x^2 + 14x - 40$

$0 = x^2 - 2x - 8$

$x = \frac{2 \pm \sqrt{(-2)^2 - 4(1)(-8)}}{2}$

$x = \frac{2 \pm 6}{2} = 8/2 = 4$ $-4/2 = -2$

given conditions.

77. Contains the point (-4, -2) and has a slope of ½.

$y+2 = \frac{1}{2}(x+4)$

$y+2 = \frac{1}{2}x + 2$

$y = \frac{1}{2}x$

78. Passes through the points (-3, 7) and (5,-3).

$m = \frac{-3-7}{5-3} = \frac{-10}{8} = -\frac{5}{4}$

$y+3 = -\frac{5}{4}(x-5)$

$y+3 = -\frac{5}{4}x + \frac{25}{4}$

$y = -\frac{5}{4}x + \frac{13}{4}$

79. Find the equation of the line that is perpendicular to #78 and passes through the point (4,1).

$m = 4/5$

$y-1 = 4/5(x-4)$

$y-1 = 4/5x - 16/5$

$y = 4/5x - 11/5$

80. Has an x – intercept of -3 and a y intercept of -1.

(-3, 0) (0, -1)

$m = \frac{0+1}{-3-0} = -1/3$

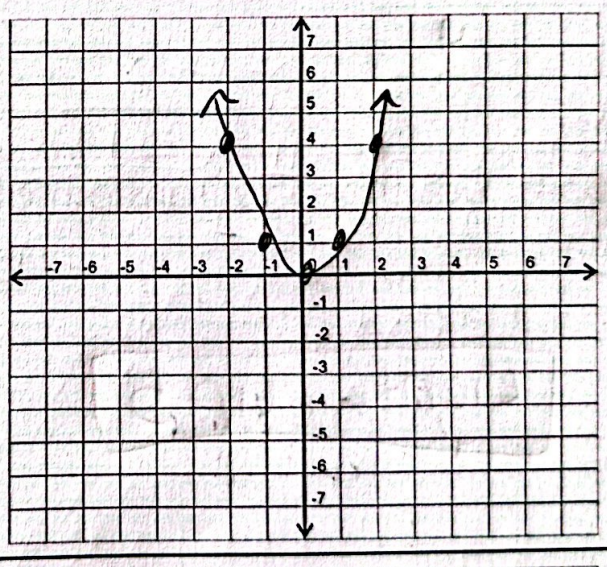
$y = -1/3(x+3)$

$y = -1/3x - 1$

Directions: Fill in the table of values and graph each parent function.

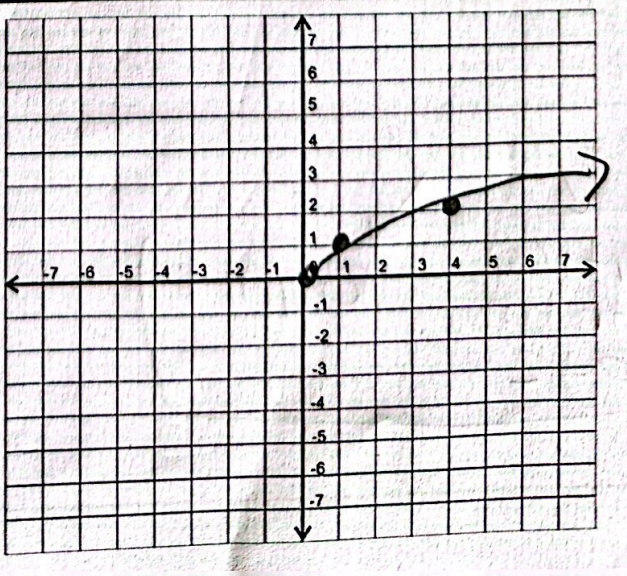
1. $y = x^2$

x	y
-2	4
-1	1
0	0
1	1
2	4



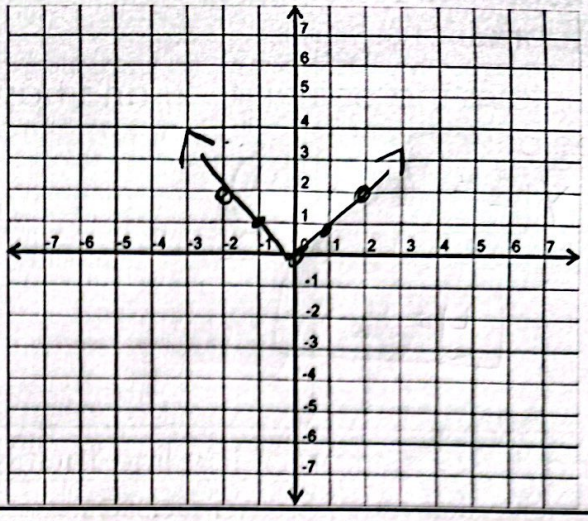
2. $y = \sqrt{x}$

x	y
0	0
1	1
4	2
9	3



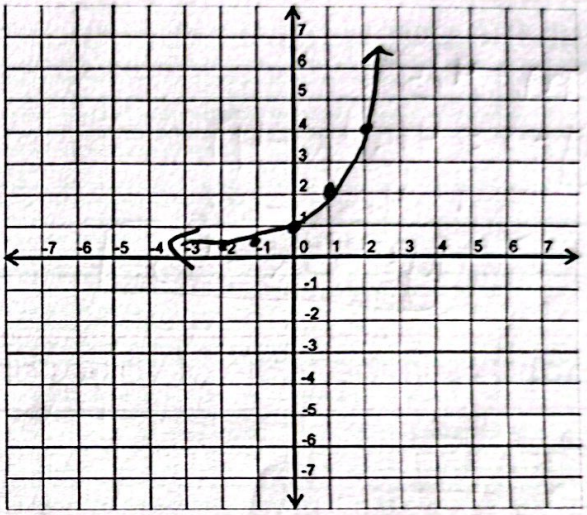
83. $y = |x|$

x	y
-2	2
-1	1
0	0
1	1
2	2



84. $y = 2^x$

x	y
-2	1/4
-1	1/2
0	1
1	2
2	4



Directions: Describe the transformation compared to the parent function.

85. $y = \sqrt{x-2}+5$

Right 2, up 5

86. $y = -(x+3)^2 - 4$

Ref x-axis, Left 3, down 4

87. $y = 2(x-1)^2$

vertical stretch by 2, Right 1

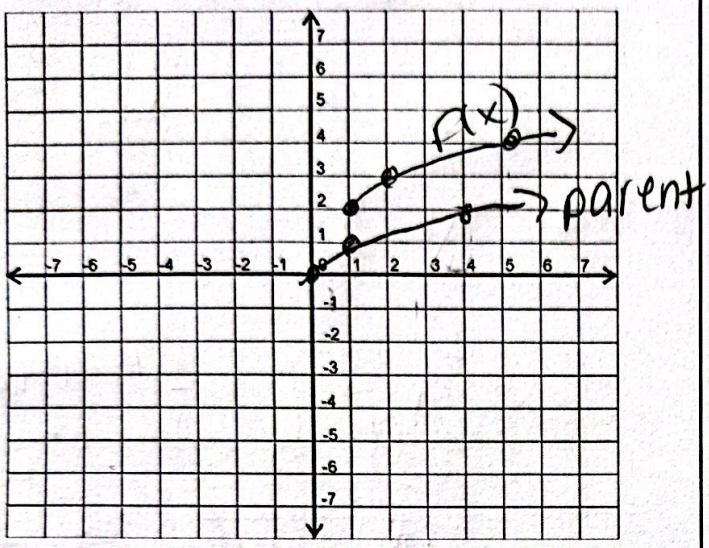
88. $y = \frac{1}{2}|x+4| - 1$

vertical shrink by 1/2, left 4, down 1

Directions: Use each parent function to graph each transformed function. NO GRAPHING CALCULATOR OR APPLICATION SHOULD BE USED.

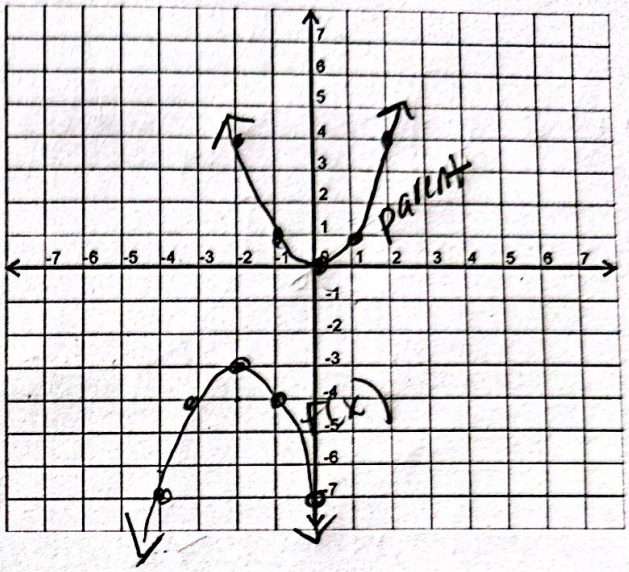
89. $y = \sqrt{x-1}+2$

Right 1 up 2



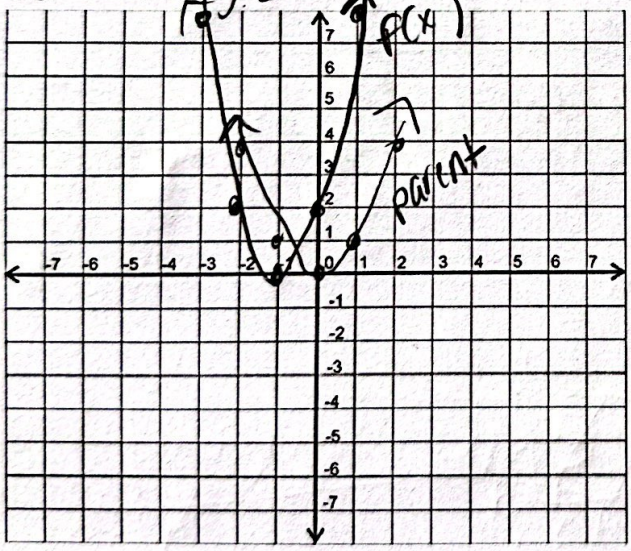
90. $y = -(x+2)^2 - 3$

ref x axis left 2 down 3



91. $y = 2(x+1)^2$

vert stretch by 2 left 1



92. $y = -\frac{1}{2}x^2 + 3$

up 3

vert shrink by 1/2

Reflect x-axis