Solve the given equation:

1. $9x^3 = 12x^4$

2. $(2y - 1)(y + 1) = (y - 3)(y - 2)$

3. $\dfrac{7}{x} - \dfrac{1}{3} = \dfrac{5}{x}$

4. $\dfrac{2x - 1}{x^2 - 2x - 3} - \dfrac{x - 5}{x^2 + 4x + 3} = \dfrac{x}{x^2 - 9}$

5. $y^2 + 6y + 11 = 2y^2 + 9y - 17$

6. $b^6 + 7b^3 - 8 = 0$

7. $\sqrt{2x - 1} - \sqrt{x + 7} = 0$

8. $\sqrt{3a + 1} + a = 1$

9. $b^{1/2} + 3b^{1/4} - 10 = 0$

10. $\sqrt[3]{2x - 5} = -3$
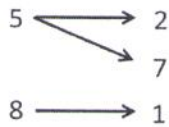
11. $(x - 7)^2 = 56$

12. $3x^2 - 13x = -19$

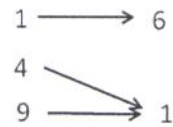**13.** $|2a - 5| = |a - 3|$

14. $|3(x - 2) + 4| = 7$

Write the relation depicted in the diagram using ordered pair notation and determine if it is a function:

15.

16.

Find the domain of the given function:

17. $y = x^2 - 5x + 8$

18. $y = \sqrt{2x - 9}$

19. $f(x) = \dfrac{3x}{\sqrt{7 - 5x}}$

20. $g(x) = \dfrac{x - 7}{2x^2 + 9x - 5}$

21. *Given* $f(x) = 2x - 5$, $g(x) = 3x^2 - 5x + 2$ *and* $h(x) = x^3 - x$, *find* :

    a) $g(5x + 2)$

    b) $f(x) - h(5)$

    c) $f(x)[h(x) - g(x)]$

22. *Given* $f(x) = 2x^2 - 5x + 1$, *find (and simplify):*

$$\dfrac{f(x + 5) - f(x)}{5}$$

23. Given $f(x) = x^2 - 2x + 5$ and $h(x) = \frac{x-2}{3-2x}$, *find (and simplify):*

$f[h(x)]$

24. Given $f(x) = \begin{cases} x^2 + 3 & \text{if } x \leq 1 \\ 2x + 1 & \text{if } x > 1 \end{cases}$

    a) *find* $f(-4), f(1)$ *and* $f(3)$ **b)** *Sketch the graph*

Determine whether each function is one-to-one. Find the domain of the function, the inverse of the function and the domain of the inverse. If there is no inverse, state so.

25. a) $\{(1,2), (-3,7), (5,8)\}$ **b)** $\{(7,-3), (3,-8), (7,4)\}$

26. $h(x) = \frac{x+1}{x-3}$ **27.** $f(x) = x^3 - 5$

Perform the indicated operations:

28. $(8x^2 - 3xy + 5y^2) - [(4x^2 - 1) - (2xy - 7y^2)]$

29. $(x^2 + 2x + 3)(x - 1)$

30. $(4a - 3b)^3$

31. $5x(x - 1) - 3x(x - 1)^2$

Factor completely:

32. $125a^3 + 8b^3$ **33.** $5ra + 5rb - 3sa - 3sb$

34. $16x^4 - 81y^4$ **35.** $9x^2 - 9x - 4$

36. $x^4 - 8x^2 - 9$

Divide:

37. $(8x^3 - 1) \div (2x - 1)$

38. $(-46y^2 + 18 + 33y - 27y^3 + 28y^4) \div (4y - 5)$

Perform the indicated operations. Express your answer in simplest form:

39. $\dfrac{3x^2 + 4x - 7}{2x^2 - 7x - 15} \cdot \left(\dfrac{2x^2 - 5x - 12}{x^2 + 2x + 1} \div \dfrac{2x^2 - 11x + 12}{x^2 - 1} \right)$

40. $\dfrac{3y}{2y - 5} - \dfrac{y}{y + 3} - \dfrac{6 + 12y}{2y^2 + y - 15}$

Simplify the fraction and reduce to lowest terms:

41. $\dfrac{a - \dfrac{2}{5}}{\dfrac{25a^2 - 4}{5a}}$

42. $\dfrac{4 - \dfrac{49}{b^2}}{6 + \dfrac{21}{b}}$

Perform the indicated operations. Express in the form a + bi:

43. $\dfrac{1 + 5i}{3 - 2i}$

44. $(2 - 5i)(3 + i)$

Perform the indicated operations and simplify: Assume all variables represent positive real numbers. Write all answers with positive exponents.

45. $(a^{-9}b^{-3}c^0)(a^{-5}b^2c^{-4})$

46. $\left(5x^{-2/3} + x^{-4/2}\right)\left(x^{1/6}\right)$

47. $\left(\dfrac{3x^{-2}x^{-3}}{x^{-1}}\right)^{-3}$

48. $\left(\dfrac{2xy^2}{x^2y^4}\right)^3 \left(\dfrac{3x^2y^3}{6}\right)^3$

49. $\dfrac{x^0 y^{-6} z^3}{y^4 x^{-5} z^{-2}}$

50. $\dfrac{\left(x^{1/2}y^{1/3}\right)^{-6}\left(x^{1/4}y^{1/5}\right)^{-20}}{xy^{1/3}}$

Perform the indicated operations. Express your answer in simplest radical form.

51. $\dfrac{3\sqrt{3}}{3\sqrt{7} - \sqrt{3}}$

52. $\dfrac{x^2 - 3x - 4}{\sqrt{x} + 2}$

53. $\dfrac{4x - 10y}{\sqrt{2x} - \sqrt{5y}}$

54. $\left(\sqrt{x + 2}\right)^2 - \left(\sqrt{x} + \sqrt{2}\right)^2$

Solve the inequalities and graph the solutions on the number line:

Express your answer using interval notation.

55. $2\{x - [3 - (5 - x)]\} > 2 - x$

56. $9 < 7 - 2(x - 1) \le 17$

57. $|5a - 4| + 4 > 3$

58. $|2(x + 1) - 5x| \ge 5$

59. $|b - 6| \le 3$

60. $2x^2 \le 12 - 5x$

61. $6x^2 + 7x + 2 > 0$

62. $10x^2 + 9x + 2 \le 0$

Write the equation of the line L satisfying the given conditions:

63. *L passes through the points* $(-3, -1)$ *and* $(-4, -6)$

64. *L passes through* $(-2, -5)$ *and is perpendicular to* $4x - 3y = 10$

65. *L passes through* $(1, -1)$ *and is parallel to* $2y - 3x = 12$

Sketch the graph of the parabola, identify the vertex, intercepts and axis of symmetry:

66. $y = -(x - 5)^2 + 2$

67. $y = 3x^2 - 6x + 1$

68. $y = x^2 - 5x$

69. $y = -x^2 + 4x - 7$

Determine the type of function and sketch its graph:

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

71. $y = 2^x$

72. $f(x) = 3^{-x}$

73. $f(x) = |x - 5| + 2$

Evaluate:

74. *a)* $6^{\log_6 8}$

b) $\log_7(\log_7 7)$

c) $\log_2(-4)$

d) $\log_8 {}^1\!/_{64}$

Solve the given equation for x:

75. *a)* $\log_4 x = 3$

b) $\log_9 {}^1\!/_3 = x$

c) $\log_x 27 = 3$

Use the properties of logarithms to express the given logarithm as a sum of simpler ones:

76. $\log_5 \sqrt{\dfrac{25x^4y^3}{a^2}}$

77. $\log_3 \dfrac{x^3}{\sqrt{xy}}$

Write the given expressions as a single logarithm:

78. $\dfrac{1}{2}[\log_3 a + \log_3 b - (\log_3 19 + 4\log_3 x)]$

79. $\log_2 \dfrac{x}{5} + \log_2 \dfrac{y}{7} - \log_2 \dfrac{z}{9}$

1) $x = 0, \qquad x = \dfrac{3}{4}$

2) $y = 1, \qquad y = -7$

3) $x = 6$

4) $x = {}^3/_2$

5) $y = -7, \qquad y = 4$

6) $b = 1, \qquad b = -2$

7) $x = 8$

8) $a = 0$

9) $b = 16$

10) $x = -11$

11) $7 \pm 2\sqrt{14}$

12) $x = \dfrac{13 \pm \sqrt{59}i}{6}$

13) $a = 2, \qquad a = {}^8/_3$

14) $x = 3, \qquad x = {}^{-5}/_3$

15) $\{(5,2),(5,7),(8,1)\}$ *Its not a function*

16) $\{(4,1),(9,1),(1,6)\}$ *It is a function*

17) *All real numbers or* $(-\infty, \infty)$

18) $\left\{x \big| x \geq {}^9/_2\right\}$

19) $\left\{x \big| x < {}^7/_5\right\}$

20) $\left\{x \big| x \neq -5, x \neq {}^1/_2\right\}$

21) *a)* $75x^2 + 35x + 4,$

   b) $2x - 125$

c) $2x^4 - 11x^3 + 23x^2 - 24x + 10$

22) $4x + 5$

23) $\dfrac{25x^2 - 78x + 61}{(3 - 2x)^2}$

24) *a)* $f(-4) = 19, \quad f(1) = 4$

   $f(3) = 7$

   Sketch of graph on page 8

25) *a)* *Domain:* $\{-3,1,5\}$

   Inverse: $\{(2,1),(7,-3),(8,5)\}$

   Domain of inverse: $\{2,7,8\}$

   b) *Domain:* $\{3,7\}$

   Since the set is not a function, there is **No Inverse**

26) *Domain:* $\{x | x \neq 3\}$ *or* $(-\infty, 3) \cup (3, \infty)$

   Inverse: $h^{-1}(x) = \dfrac{3x + 1}{x - 1}$

   Domain of inverse: $\{x | x \neq 1\}$

   or $(-\infty, 1) \cup (1, \infty)$

27) *Domain: All real numbers or* $(-\infty, \infty)$

   Inverse: $f^{-1}(x) = \sqrt[3]{x + 5}$

   Domain of $f^{-1}(x)$: *All real numbers*

   or $(-\infty, \infty)$

28) $4x^2 - xy - 2y^2 + 1$

29) $x^3 + x^2 + x - 3$

30) $64a^3 - 144a^2b + 108ab^2 - 27b^3$

31) $-3x^3 + 11x^2 - 8x$

32) $(5a + 2b)(25a^2 - 10ab + 4b^2)$

33) $(5r - 3s)(a + b)$

34) $(2x - 3y)(2x + 3y)(4x^2 + 9y^2)$

35) $(3x - 4)(3x + 1)$

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

37) $4x^2 + 2x + 1$

38) $7y^3 + 2y^2 - 9y - 3 + \dfrac{3}{4y-5}$

39) $\dfrac{(3x + 7)(x - 1)^2}{(x - 5)(x + 1)(2x - 3)}$

40) $\dfrac{y^2 + 2y - 6}{(2y - 5)(y + 3)}$

41) $\dfrac{a}{5a + 2}$

42) $\dfrac{(2b - 7)}{3b}$

43) $\dfrac{-7}{13} + \dfrac{17}{13}i$

44) $11 - 13i$

45) $\dfrac{1}{a^{14}bc^4}$

46) $\dfrac{5\sqrt{x}}{x} + \dfrac{1}{x^{11/6}}$

47) $\dfrac{x^{12}}{27}$

48) x^3y^3

49) $\dfrac{x^5 z^5}{y^{10}}$

50) $\dfrac{1}{x^9 y^{19/3}}$

51) $\dfrac{3(\sqrt{21} + 1)}{20}$

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

53) $2(\sqrt{2x} + \sqrt{5y})$

54) $- 2\sqrt{2x}$

55) $(-2, \infty)$
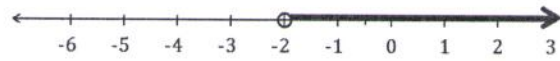
56) $[-4, 0)$

57) *All real numbers*

58) $(-\infty, -1] \cup [{}^{7}/_{3}, \infty)$
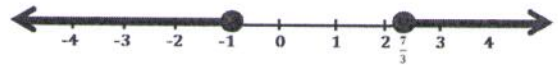
59) $[3, 9]$

60) $\left[-4, {}^{3}/_{2}\right]$

61) $\left(-\infty, {}^{-2}/_{3}\right) \cup \left({}^{-1}/_{2}, \infty\right)$
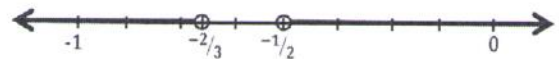
62) $[\dfrac{-1}{2}, \dfrac{-2}{5}]$

63) $y = 5x + 14$

64) $y = \dfrac{-3}{4}x - \dfrac{13}{2}$

65) $y = \dfrac{3}{2}x - \dfrac{5}{2}$

66 – 73) *Next Page*

74) *a)* 8 *b)* 0 *c)* *DNE* *d)* $- 2$

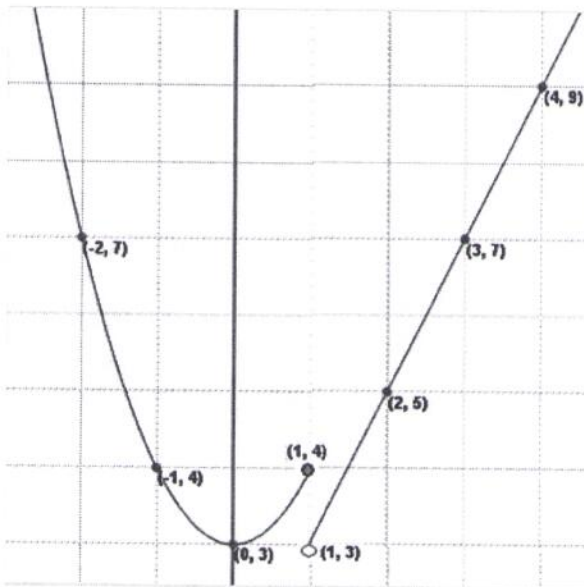**75)** *a)* $x = 64$ *b)* $x = {}^{-1}/_{2}$ *c)* $x = 3$

76) $\dfrac{1}{2}(2 + 4\log_5 x + 3\log_5 y - 2\log_5 a)$

77) $3\log_3 x - \dfrac{1}{2}\log_3 x - \dfrac{1}{2}\log_3 y$
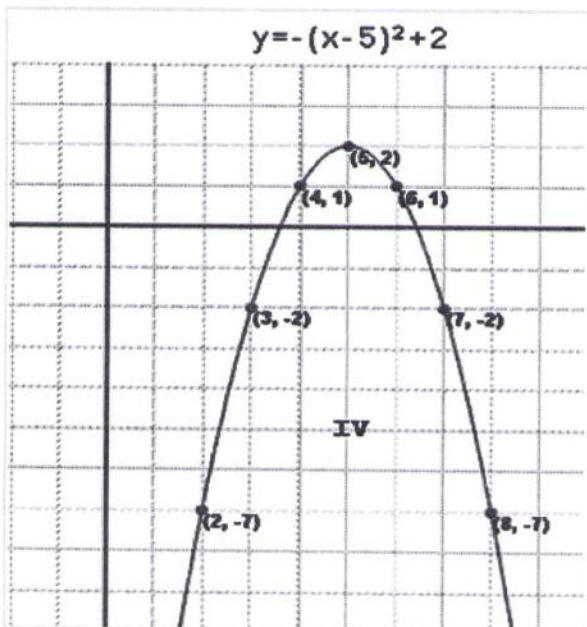
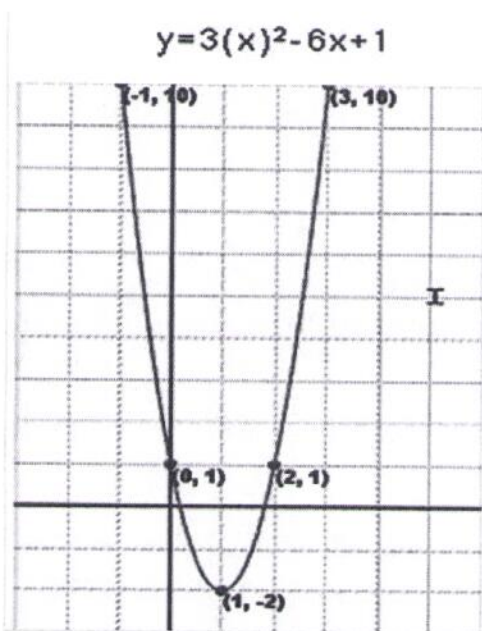**78)** $\log_3 \sqrt{\dfrac{ab}{19x^4}}$

79) $\log_2 \dfrac{9xy}{35z}$
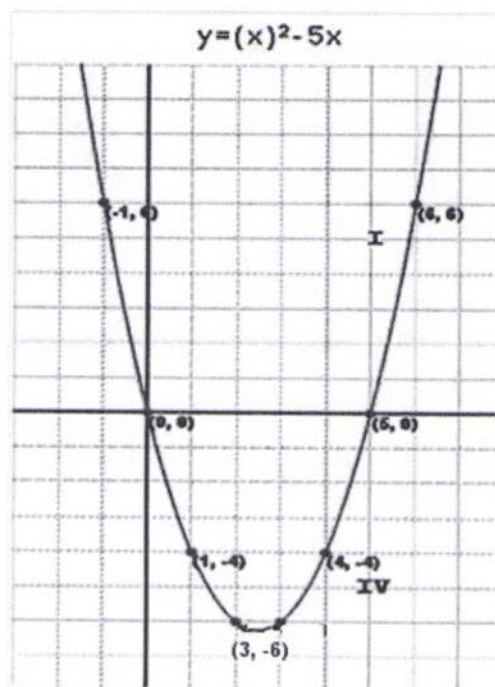
24b)

Graphs: Problems 66 – 73

66) $x - intercepts$: $x = 5 \pm \sqrt{2}$
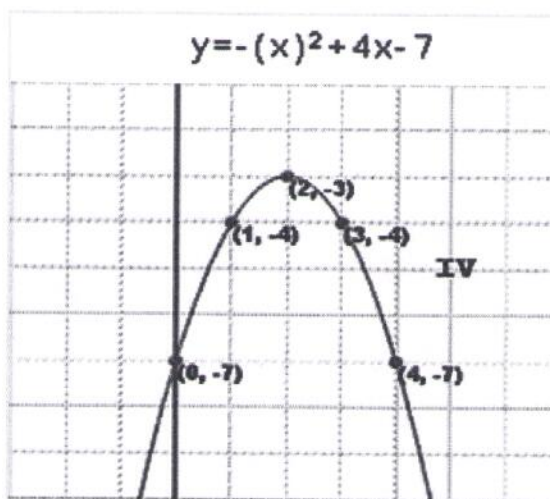 $vertex$: $(5,2)$
    $axis - symmetry$: $x = 5$

y=-(x-5)²+2

67) $x - intercepts$: $x = \dfrac{3 \pm \sqrt{6}}{3}$
    $vertex$: $(1,-2)$
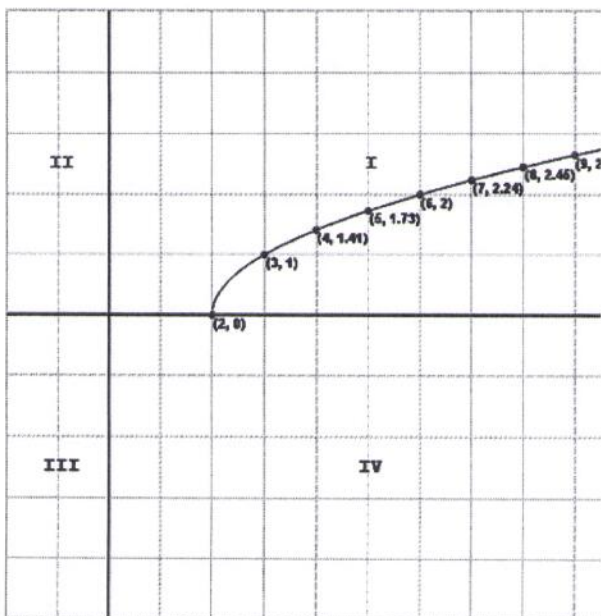 $axis - symmetry$: $x = 1$

y=3(x)²-6x+1

68) $x - intercepts$: $(0,0), (5,0)$
    $vertex$: $(\frac{5}{2}, \frac{-25}{4})$
    $axis - symmetry$: $x = \frac{5}{2}$

y=(x)²-5x

69) $x - intercepts$: $None$
    $vertex$: $(2,-3)$
    $axis - symmetry$: $x = 2$

y=-(x)²+4x-7

70) *Square Root Function*

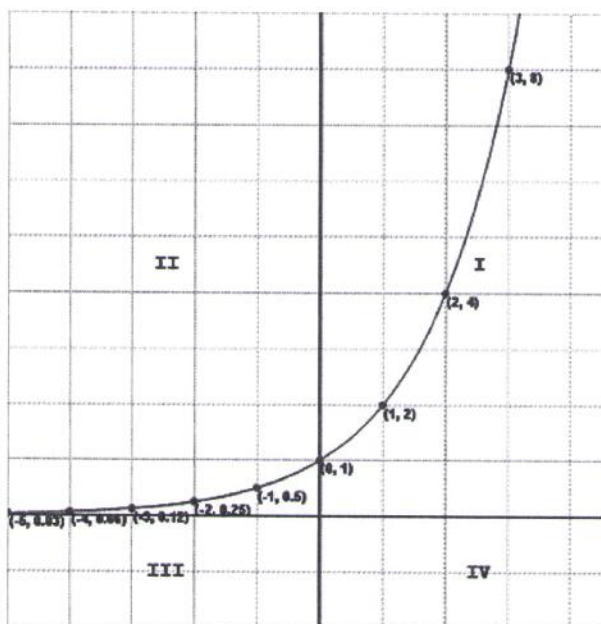## 72) *Exponential Function*
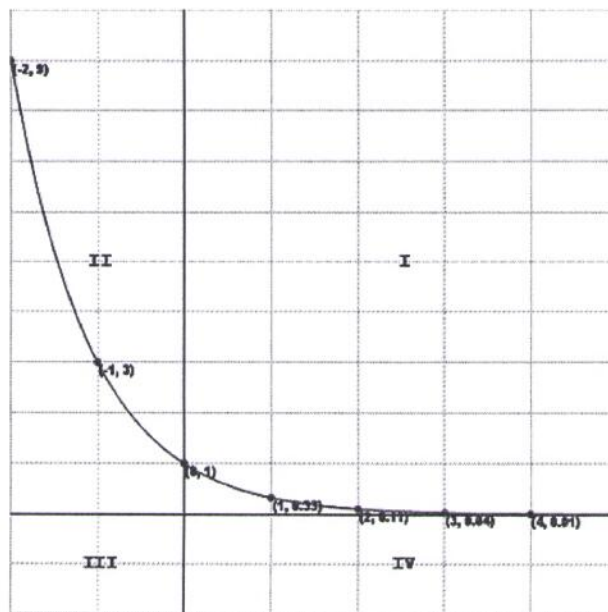
71) *Exponential Function*

73) *Absolute Value Function*