

Math 108 Final Review

Name MS.

1. Simplify: $-8 - 2(1 - 6)^2 \div (-5)$

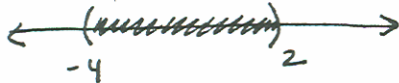
$$-8 - 2(25) \div (-5)$$

$$-8 - 50 \div (-5)$$

$$-8 + 10 = \boxed{2}$$

3. Graph the solution set of:

$$\{x|x > -4\} \cap \{x|x < 2\}$$



5. Evaluate $ab - (a - 2c)$ when $a = 4$, $b = -3$, and $c = -2$.

$$(4)(-3) - (4 - 2(-2))$$

$$-12 - (4 + 4)$$

$$-12 - 8 = \boxed{-20}$$

7. Simplify: $3x - 2(2x - 3y) + 2(2y - x)$

$$3x - 4x + 6y + 4y - 2x$$

$$\boxed{-3x + 10y}$$

9. Solve: $10 - 2(3 - x) \leq 4(2x - 5)$

$$10 - 6 + 2x \leq 8x - 20$$

$$4 + 2x \leq 8x - 20$$

$$\frac{-6x \leq -24}{-6} \quad \frac{-24}{-6}$$

$$\boxed{x \geq 4}$$

11. An investment of \$4800 is made at an annual simple interest rate of 8.5%. How much additional money must be invested at an interest rate of 13% so that the total interest earned is \$720?

1st	4800	.085	408
Additional	X	.13	.13X

$$408 + .13X = 720$$

$$.13X = 312$$

$$X = 2400$$

$$\boxed{\$2400}$$

13. A bicyclist traveling at 18mph overtakes an in-line skater who is traveling at 10mph and has a 0.5-hour head start. How far from the starting point did the bicyclist overtake the skater?

biker $\xrightarrow{(18)(x)}$
skater $10(x + .5)$

$$18x = 10(x + .5)$$

$$18x = 10x + 5$$

$$8x = 5$$

$$x = \frac{5}{8} \text{ hr}$$

Need how far so

$$(18)\left(\frac{5}{8}\right) = \boxed{11.25 \text{ miles}}$$

2. Solve: $x - 5 < -2$ or $2x - 1 > 8$

Write in set builder and interval notation.

$$x < 3 \quad \text{or}$$

$$2x > 9$$

$$x > \frac{9}{2}$$

$$(-\infty, 3) \cup$$

$$\left(\frac{9}{2}, \infty\right)$$

$$\{x | x < 3 \cup x > \frac{9}{2}\}$$

$$\text{(or)} \quad \frac{3}{8} - \left(\frac{5}{6} \div \frac{5}{8}\right) + \frac{3}{4}$$

$$\frac{3}{8} - \frac{8}{3} \cdot \frac{8}{5} + \frac{3}{4}$$

$$\frac{3}{8} - \left(\frac{4}{3}\right) + \frac{3}{4} = \frac{9}{24} - \frac{32}{24} + \frac{18}{24} = \boxed{\frac{-5}{24}}$$

6. Given; $A = \{0, 1, 2, 3\}$ and $B = \{-2, 0, 2, 4\}$

a) Find $A \cup B = \{0, 1, 2, 3, -2, 4\}$

b) Find $A \cap B = \{0, 2\}$

8. Solve: $\frac{3}{2}x - 5 = 7$

$$2\left(\frac{3}{2}x - 5\right) = (7)^2$$

$$\frac{3}{2}x = 12$$

$$x = \frac{4}{3} \cdot \frac{2}{2}$$

$$x = 8$$

$$3x - 10 = 14$$

$$3x = 24$$

$$\boxed{x = 8}$$

10. A child's piggy bank contains nickels, dimes and quarters. There are twice as many nickels as dimes and five more dimes than quarters. The total value of all the coins is \$5.95. How many quarters are in the bank?

	#	value
N	$2(x+5)$	$.05[2(x+5)]$
D	$x+5$	$.10(x+5)$
Q	x	$.25x$

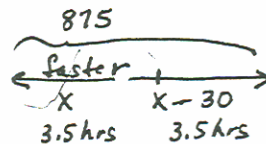
$$.05(2x+10) + .10(x+5) + .25x = 5.95$$

$$.10x + .5 + .10x + .5 + .25x = 5.95$$

$$.45x = 4.95$$

$$\boxed{x = 11}$$

12. Two planes start from the same point and fly in opposite directions. The first plane is flying 30 mph faster than the second plane. In 3.5 hours the planes are 875 miles apart. Find the rate of the faster plane. (rate)(time) = distance



$$3.5x + 3.5(x - 30) = 875$$

$$3.5x + 3.5x - 105 = 875$$

$$7x = 980$$

$$\boxed{x = 140 \text{ mph}}$$

14. The sum of two integers is sixteen. Five times the smaller integer is eight more than three times the larger integer. Find the two integers.

$$\begin{aligned} \text{small} = x & \quad 3(x+y=16) \rightarrow 3x+3y=48 \\ \text{large} = y & \quad 5x=8+3y \rightarrow 5x-3y=8 \end{aligned}$$

$$\begin{aligned} 8x &= 56 \\ \boxed{x=7} \\ 7+y &= 16 \Rightarrow \boxed{y=9} \end{aligned}$$

OR $x = \text{small}$
 $16-x = \text{large}$
 $5x = 8 + 3(16-x)$
 $5x = 8 + 48 - 3x$
 $8x = 56 \Rightarrow x=7 + y=9$

15. Find the **midpoint** and the **distance** of the line segment with endpoints (5, -1) and (8, -3).

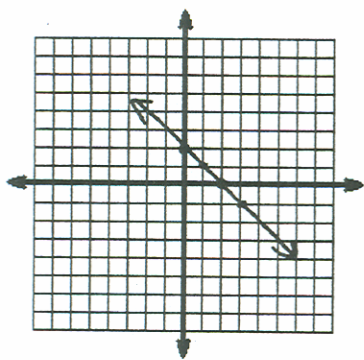
a) midpoint

$$\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2} \right) = \left(\frac{5+8}{2}, \frac{-1+(-3)}{2} \right) = \left(\frac{13}{2}, -2 \right)$$

b) distance

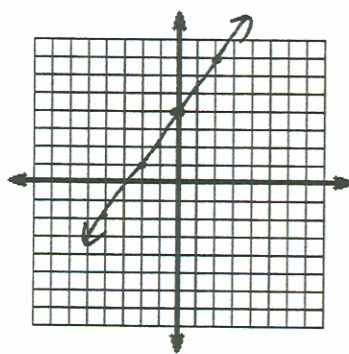
$$\begin{aligned} \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2} &= \\ \sqrt{(8-5)^2 + (-3+1)^2} &= \sqrt{(3)^2 + (-2)^2} \\ &= \sqrt{9+4} = \boxed{\sqrt{13}} \end{aligned}$$

16. Graph: $y = -x + 2$



$y\text{-int} = (0, 2)$
 $\text{slope} = \frac{-1}{1}$

17. Graph: $3x - 2y = -8$



$\begin{array}{c|c} x & y \\ \hline 0 & 4 \\ -\frac{8}{3} & 0 \end{array}$ or

$$\begin{aligned} -2y &= -3x - 8 \\ y &= \frac{3}{2}x + 4 \end{aligned}$$

18. Find the **slope** of the line containing the points (-3, 4) and (1, -6).

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{-6 - 4}{1 - (-3)} = \frac{-10}{4} = \boxed{-\frac{5}{2}}$$

19. Find the **x and y intercepts** of $3x + 2y = 1$.

$x\text{-int} \Rightarrow y=0$ so $3x=1$
 $x = \frac{1}{3}$ $\left(\frac{1}{3}, 0 \right)$

$y\text{-int} \Rightarrow x=0$ so $2y=1$
 $y = \frac{1}{2}$ $\left(0, \frac{1}{2} \right)$

20. Find the **equation of the line** that contains the point (-4, 0) and has a slope of $-\frac{3}{2}$.

$$\begin{aligned} y - y_1 &= m(x - x_1) \\ y - 0 &= -\frac{3}{2}(x - (-4)) \\ \boxed{y} &= \boxed{-\frac{3}{2}x - 6} \end{aligned}$$

22. Find the **equation of the line** that contains the point (2, -3) and is **parallel** to the line $y = \frac{5}{2}x - 4$.
- $\xrightarrow{\text{needs slope}} \frac{5}{2}$

$$\begin{aligned} y - (-3) &= \frac{5}{2}(x - 2) \\ y + 3 &= \frac{5}{2}x - 5 \\ \boxed{y} &= \boxed{\frac{5}{2}x - 8} \end{aligned}$$

21. Find the **equation of the line** containing

the points (3, -4) and (-2, 1).

$$\text{slope} = \frac{1 - (-4)}{-2 - 3} = \frac{1+4}{-5} = \frac{5}{-5} = -1$$

$$\begin{aligned} y - 1 &= -1(x - (-2)) \\ y - 1 &= -1(x + 2) \\ y - 1 &= -x - 2 \end{aligned} \rightarrow \boxed{y = -x - 1}$$

23. Given $P(x) = x^2 - 7$

a) Evaluate: $P(-2) = (-2)^2 - 7$
 $4 - 7 = \boxed{-3}$

b) Evaluate: $P(t) =$

$$\boxed{t^2 - 7}$$

24. Solve by Substitution:

$$3x - 2y = 13$$

$$-2x + y = 1 \Rightarrow y = 2x + 1$$

$$3x - 2(2x + 1) = 13 \quad y = 2(-15) + 1$$

$$3x - 4x - 2 = 13 \quad y = -29$$

$$-x = 15$$

$$x = -15$$

$$\boxed{(-15, -29)}$$

26. Solve by Cramer's Rule:

$$x + 3y = -1$$

$$2x + 2y = 1$$

$$\Delta = \begin{vmatrix} 1 & 3 \\ 2 & 2 \end{vmatrix} = 2 - 6 = -4$$

$$x = \frac{\begin{vmatrix} -1 & 3 \\ 1 & 2 \end{vmatrix}}{\Delta} = \frac{-5}{-4} = \frac{5}{4}$$

$$\boxed{\left(\frac{5}{4}, -\frac{3}{4}\right)}$$

$$y = \frac{\begin{vmatrix} 1 & -1 \\ 2 & 1 \end{vmatrix}}{\Delta} = \frac{3}{-4} = -\frac{3}{4}$$

28. Evaluate the determinants:

$$\begin{vmatrix} 5 & 6 \\ -1 & 3 \end{vmatrix} = 15 + 6 = \boxed{21}$$

$$\begin{vmatrix} 1 & -1 & 2 \\ 0 & 1 & 3 \\ -1 & 2 & 1 \end{vmatrix} = 1(-5) + 1(3) + 2(1) - 5 + 3 + 2 = \boxed{0}$$

30. Simplify: $\frac{(6x^2y)^2}{(-2xy^2)^3} = \frac{36x^4y^2}{-8x^3y^6}$

$$= \boxed{\frac{-9x}{2y^4}}$$

32. Multiply: $(2a - 5)(a^2 - 3a - 9)$

$$2a^3 - 6a^2 - 18a - 5a^2 + 15a + 45$$

$$\boxed{2a^3 - 11a^2 - 3a + 45}$$

34. Factor: $x^2y^2 - 49$

$$(xy - 7)(xy + 7)$$

36. Factor: $6x^6 + 14x^4 - 40x^2$

$$2x^2(3x^4 + 7x^2 - 20)$$

$$2x^2(3x^2 - 5)(x^2 + 4)$$

25. Solve by addition method:

$$2x + 3y = 7 \rightarrow 2x + 3y = 7$$

$$3(4x - y = 1) \rightarrow 12x - 3y = 3$$

$$14x = 10$$

$$x = \frac{10}{14} = \frac{5}{7}$$

$$4\left(\frac{5}{7}\right) - y = 1$$

$$\frac{20}{7} - y = \frac{7}{7}$$

$$-y = -\frac{13}{7} \Rightarrow y = \frac{13}{7}$$

$$\boxed{\left(\frac{5}{7}, \frac{13}{7}\right)}$$

27. Solve by any method:

$$2(5x - y - 2z = 4) \rightarrow 10x - 2y - 4z = 8$$

$$\text{add } \begin{cases} x + 2y - 4z = -13 \\ 2x - 2y + 3z = 14 \end{cases} \rightarrow \begin{cases} x + 2y - 4z = -13 \\ 11x - 8z = -5 \end{cases}$$

$$-8 \quad \begin{cases} 3x - z = 1 \\ 11x - 8z = -5 \end{cases} \rightarrow -24x + 8z = -8$$

$$-13x = -13$$

$$\boxed{x = 1}$$

$$(1, -3, 2)$$

29. Simplify:

$$\left(x^{\frac{3}{4}} \cdot x^{\frac{1}{2}}\right)^2$$

$$\left(x^{\frac{3}{4} + \frac{2}{4}}\right)^2$$

$$\left(x^{\frac{5}{4}}\right)^2 = x^{\frac{10}{4}}$$

$$\boxed{x^{\frac{5}{2}}}$$

$$3(1) - z = 1$$

$$-z = -2$$

$$\boxed{z = 2}$$

$$x + 2y - 4z = -13$$

$$1 + 2y - 4(2) = -13$$

$$2y - 7 = -13$$

$$2y = -6$$

$$\boxed{y = -3}$$

31. Simplify: $\left(\frac{4a^4}{b^2}\right)^{-\frac{3}{2}} = \left(\frac{b^2}{4a^4}\right)^{\frac{3}{2}}$

$$= \frac{b^3}{4^{\frac{3}{2}} a^6} = \boxed{\frac{b^3}{8a^6}}$$

33. Multiply: $(3a - 4b)(2a + 5b)$

$$6a^2 + 15ab - 8ab - 20b^2$$

$$\boxed{6a^2 + 7ab - 20b^2}$$

35. Factor: $x^3 + 125 \rightarrow a = x, b = 5$

$$(x + 5)(x^2 - 5x + 25)$$

37. Factor: $ay - 3ax - 2by + 6bx$

$$a(y - 3x) - 2b(y - 3x)$$

$$(y - 3x)(a - 2b)$$

38. Divide: $\frac{x^3 + 4x^2 - x - 2}{x+1}$ (long or synthetic)

$$\begin{array}{r} -1 \\ 1 \\ \underline{-1 } \\ 4 \\ \underline{-4 } \\ 2 \end{array}$$

$$x^2 + 3x - 4 + \frac{2}{x+1}$$

or $x+1 \overline{) x^3 + 4x^2 - x - 2}$

$$\begin{array}{r} x^2 + 3x - 4 + \frac{2}{x+1} \\ \underline{\ominus x^3 + x^2} \\ 3x^2 - x \\ \underline{\ominus 3x^2 + 3x} \\ -4x - 2 \\ \underline{\oplus 4x + 4} \\ 2 \end{array}$$

40. Write $(a^3 b^4)^{\frac{2}{3}}$ as a radical expression.

$$a^{6/3} b^{8/3} =$$

$$\sqrt[3]{a^6 b^8} = a^2 b^2 \sqrt[3]{b^2}$$

or $\sqrt[3]{(a^3 b^4)^2}$

42. Subtract:

a) $\sqrt{32} - \sqrt{8}$

$$\frac{16 \cdot 2}{4\sqrt{2}} - \frac{4 \cdot 2}{4\sqrt{2}} = \boxed{2\sqrt{2}}$$

b) $\sqrt{64a^5 b^3} - 3a\sqrt{9a^3 b^3}$

$$8a^2 b \sqrt{ab} - 9a^2 b \sqrt{ab} = \boxed{-a^2 b \sqrt{ab}}$$

44. Simplify: $\frac{\sqrt{40a^2 b}}{\sqrt{32a^3 b^3}} = \frac{\sqrt{5}}{\sqrt{4ab^2}}$

$$= \frac{\sqrt{5}}{2b\sqrt{a}} \cdot \frac{\sqrt{a}}{\sqrt{a}} = \boxed{\frac{\sqrt{5a}}{2ab}}$$

46. Simplify: $\frac{4}{\sqrt[5]{16a^2}} \cdot \frac{\sqrt[5]{2a^3}}{\sqrt[5]{2a^3}} = \frac{4\sqrt[5]{2a^3}}{\sqrt[5]{2^5 a^5}}$

$$\frac{2 \cdot 2 \cdot 2 \cdot 2}{4\sqrt[5]{2a^3}} = \boxed{\frac{2\sqrt[5]{2a^3}}{a}}$$

48. Simplify: $\frac{2i}{2+3i}$

$$\frac{2i}{2+3i} \cdot \frac{(2-3i)}{2-3i} = \frac{4i - 6i^2}{4 - 6i + 6i - 9i^2} = \frac{4i + 6}{13}$$

$$= \boxed{\frac{6}{13} + \frac{4i}{13}}$$

50. Solve: $\sqrt[3]{5-x-8} = -5$

$$\sqrt[3]{5-x} = 3$$

$$(\sqrt[3]{5-x})^3 = 3^3$$

$$5-x = 27$$

$$-x = 22$$

$$\boxed{x = -22}$$

39. Simplify: $(3x-4)^2 =$ FOIL!

$$(3x-4)(3x-4)$$

$$9x^2 - 12x - 12x + 16$$

$$\boxed{9x^2 - 24x + 16}$$

41. Simplify: a) $\sqrt[4]{28a^4 b^9} = \boxed{2a^2 b^4 \sqrt[4]{7b}}$

b) $\sqrt[3]{729x^{11}y^7} = \boxed{3x^2 y^5 \sqrt[3]{3xy^2}}$

$$\begin{array}{l} 3 \cdot 243 \\ 3 \cdot 3 \cdot 81 \\ 3 \cdot 3 \cdot 9 \cdot 9 \\ 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \end{array}$$

43. Multiply and simplify:

$$(\sqrt{2}-3)(\sqrt{2}+4)$$

$$\sqrt{4} + 4\sqrt{2} - 3\sqrt{2} - 12$$

$$2 \boxed{-10 + \sqrt{2}}$$

45. Simplify: $\frac{4}{2+\sqrt{5}} \cdot \frac{2-\sqrt{5}}{2-\sqrt{5}} =$

$$\frac{4(2-\sqrt{5})}{4-2\sqrt{5}+2\sqrt{5}-5} = \frac{8-4\sqrt{5}}{-1} = \boxed{-8+4\sqrt{5}}$$

47. Simplify: $\sqrt{32} - \sqrt{-8}$

$$\frac{16 \cdot 2}{4\sqrt{2}} - \frac{4 \cdot 2}{4\sqrt{2}} = \boxed{4\sqrt{2} - 2i\sqrt{2}}$$

49. $(4-9i)(1+3i)$

$$4 + 12i - 9i - 27i^2$$

$$4 + 3i + 27$$

$$\boxed{31 + 3i}$$

51. Solve: $(\sqrt{3x+10})^2 = (x+4)^2$

$$3x+10 = x^2 + 8x + 16$$

$$0 = x^2 + 5x + 6$$

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

$$\frac{x+3=0}{x=-3} \quad \frac{x+2=0}{x=-2}$$

Check:

$$x = -3$$

$$\sqrt{1} = -3 + 4$$

4 = 1 yes

$$x = -2$$

$$\sqrt{4} = -2 + 4$$

2 = 2 yes

52. Solve: $(\sqrt{2x+4})^2 = (3-\sqrt{2x})^2$
 $(\sqrt{2x+4})^2 = (3-\sqrt{2x})(3-\sqrt{2x})$
 $2x+4 = 9 - 3\sqrt{2x} - 3\sqrt{2x} + 2x$
 $-5 = -6\sqrt{2x} \rightarrow 25 = 72x$
 $25 = 36(2x)$
 $x = \frac{25}{72}$

54. Simplify: $\frac{16x^2-9}{4x^2+5x-6} \cdot \frac{2x^2+x-6}{4x^2-9x-9}$
 $\frac{(4x+3)(4x-3)}{(4x-3)(x+2)} \cdot \frac{(2x-3)(x+2)}{(4x+3)(x-3)} = \frac{2x-3}{x-3}$

56. Simplify: $\frac{\left[3 - \frac{6}{x+4}\right](x+4)}{\left[x + \frac{4}{x+4}\right](x+4)}$
 $\frac{3x+12-6}{x^2+4x+4} = \frac{3x+6}{(x+2)(x+2)} = \frac{3(x+2)}{(x+2)(x+2)}$
 $= \frac{3}{x+2}$

58. Solve: $\frac{6}{y} = \frac{-2}{3-y}$
 $-2y = 6(3-y)$
 $-2y = 18 - 6y$
 $4y = 18$
 $y = \frac{18}{4} = \frac{9}{2}$

60. Solve: $I = \frac{E}{R+r}$ for R
 $I(R+r) = E$
 $IR + Ir = E$
 $IR = E - Ir$
 $R = \frac{E - Ir}{I}$
 or $\frac{E}{I} - r$

62. Write a quadratic equation that has integer coefficients and has solutions $\frac{1}{2}$ and -4 .
 $(x - \frac{1}{2})(x + 4) = 0$
 or $(2x - 1)(x + 4) = 0$
 $2x^2 + 7x - 4 = 0$

53. Simplify: $\frac{5x^4 - 10x^3}{5x^3 - 20x^2 + 20x}$
 $\frac{5x^3(x-2)}{5x(x^2-4x+4)} = \frac{5x^3(x-2)}{5x(x-2)(x-2)}$
 $= \frac{x^2}{x-2}$

55. Subtract: $\frac{(x+2)(x+2)}{x^2-3x+2} - \frac{1-x}{x^2-4}$
 $\frac{(x+2)(x+2)}{(x-2)(x-1)} - \frac{1-x}{(x-2)(x+2)}$
 $\frac{x^2+4x+4}{(x-2)(x-1)(x+2)} - \frac{x-1}{(x-2)(x-1)(x+2)} = \frac{2x^2+2x+5}{(x-2)(x-1)(x+2)}$

57. Simplify: $X^2 \left[1 + \frac{2}{x} - \frac{3}{x^2}\right]$
 $X^2 \left[1 + \frac{6}{x} + \frac{9}{x^2}\right]$
 $\frac{2x^2+2x+5}{(x-2)(x-1)(x+2)}$

$\frac{x^2+2x-3}{x^2+6x+9} = \frac{(x+3)(x-1)}{(x+3)(x+3)} = \frac{x-1}{x+3}$

59. Solve: $\left[\frac{x}{x-3} - \frac{2}{x+4} = 2\right] (x-3)(x+4)$
 $x(x+4) - 2(x-3) = 2(x^2+x-12)$
 $x^2+4x-2x+6 = 2x^2+2x-24$
 $0 = x^2-30 \Rightarrow 30 = x^2$
 $\pm\sqrt{30} = x$

61. Solve: $A+B = T$ for A
 $A+B = Tn$
 $A = Tn - B$

63. Solve by taking square roots:
 $(x-3)^2 - 18 = 0$
 $(x-3)^2 = 18$
 $\sqrt{(x-3)^2} = \pm\sqrt{18}$
 $x-3 = \pm 3\sqrt{2}$
 $x = 3 \pm 3\sqrt{2}$

4. Solve by completing the square:

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

$$x^2 - 10x = 7$$

$$x^2 - 10x + 25 = 7 + 25$$

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

$$(x-5)^2 = 32$$

$$(x-5)^2 = \pm \sqrt{32}$$

$$x-5 = \pm 4\sqrt{2}$$

$$x = 5 \pm 4\sqrt{2}$$

66. Solve: $x^4 - x^2 - 6 = 0$

$$(x^2 - 3)(x^2 + 2) = 0$$

$$x^2 - 3 = 0 \quad x^2 + 2 = 0$$

$$x^2 = 3 \quad x^2 = -2$$

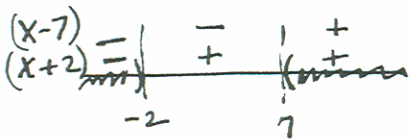
$$x = \pm \sqrt{3}$$

$$x = \pm \sqrt{-2}$$

$$x = \pm i\sqrt{2}$$

68. Solve: $x^2 - 5x - 14 > 0$ (Use a number line!)

$$(x-7)(x+2) > 0 \quad \text{Critical \#s: } 7, -2$$



$$x < -2 \cup x > 7$$

$$(-\infty, -2) \cup (7, \infty)$$

70. Graph: $y = x^2 + 6x + 2$

$$-\frac{b}{2a} = \frac{-6}{2(1)} = -3$$

Name the

vertex: $(-3, -7)$

axis of sym: $x = -3$

Domain: all reals

Range: $y \geq -7$

x-intercepts: $(x + y = 0)$

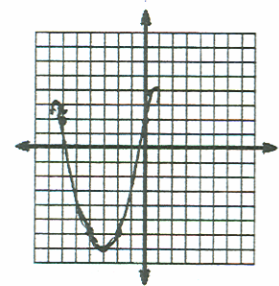
$$0 = x^2 + 6x + 2$$

$$x = \frac{-6 \pm \sqrt{36 - 4(1)(2)}}{2(1)}$$

$$= \frac{-6 \pm \sqrt{28}}{2} = \frac{-6 \pm 2\sqrt{7}}{2} = -3 \pm \sqrt{7}$$

$$x = -1 \pm \sqrt{7}$$

$$(-3 \pm \sqrt{7}, 0)$$



$$9 - 18 + 2$$

65. Solve by using the quadratic formula:

$$x^2 - 6x = -1$$

$$x^2 - 6x + 1 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{6 \pm \sqrt{36 - 4(1)(1)}}{2(1)} = \frac{6 \pm \sqrt{32}}{2}$$

$$\frac{6 \pm 4\sqrt{2}}{2} = 3 \pm 2\sqrt{2}$$

67. Solve: $x - 8x^{1/2} + 15 = 0$

$$(x^{1/2} - 5)(x^{1/2} - 3) = 0$$

$$x^{1/2} - 5 = 0$$

$$x^{1/2} - 3 = 0$$

$$x^{1/2} = 5$$

$$x^{1/2} = 3$$

or $\sqrt{x} = 5$
 $x = 25$

or $\sqrt{x} = 3$
 $x = 9$

Check!

$$x = 25$$

$$25 - 8\sqrt{25} + 15$$

$$25 - 40 + 15 = 0 = 0$$

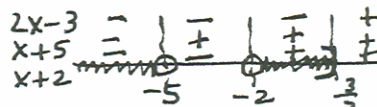
$$x = 9$$

$$9 - 8\sqrt{9} + 15 = 0$$

$$9 - 24 + 15 = 0 = 0$$

69. Solve: $\frac{2x-3}{(x+5)(x+2)} \leq 0$

Critical \#s: $\frac{3}{2}, -5, -2$



$$x < -5 \cup -2 < x \leq \frac{3}{2}$$

$$(-\infty, -5) \cup (-2, \frac{3}{2}]$$

71. Given: $f(x) = x^2 - 5$ and $h(x) = 2x + 4$

a) find $(f-h)(-2) = f(-2) - h(-2)$

$$[(-2)^2 - 5] - [2(-2) + 4]$$

$$[4 - 5] - 0 = -1 - 0 = -1$$

b) find $h[f(2)] = h(-1) = 2(-1) + 4$

$$(2)^2 - 5 = -1$$

$$= -2 + 4 = 2$$

c) find $h^{-1}(x)$

$$x = 2y + 4$$

$$x - 4 = 2y$$

$$\frac{x-4}{2} = y$$

$$h^{-1}(x) = \frac{x-4}{2}$$

73. Find the x-intercepts for

$$F(x) = x^2 - 4x - 12$$

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

$$0 = (x-6)(x+2)$$

$$x-6 = 0$$

$$x+2 = 0$$

$$x = 6$$

$$x = -2$$

$$(6, 0) \text{ and } (-2, 0)$$

72. Find the inverse of $f(x) = \frac{1}{2}x + 13$

$$x = \frac{1}{2}y + 13$$

$$x - 13 = \frac{1}{2}y$$

$$2x - 26 = y \quad f^{-1}(x) = 2x - 26$$

74. $f(x) = 3^{x-3}$; evaluate $f(2)$

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

75. Solve: $4^{2x-1} = 8^x$

$$(2^2)^{2x-1} = (2^3)^x$$

$$2^{4x-2} = 2^{3x}$$

$$4x-2 = 3x$$

$$x = 2$$

77. Solve: $\log_5\left(\frac{1}{25}\right) = x$

$$5^x = \frac{1}{25} = \frac{1}{5^2} = 5^{-2}$$

$$5^x = 5^{-2} \Rightarrow x = -2$$

78. Solve: $\log_3(5x-3) = 3$

$$3^3 = 5x-3$$

$$27 = 5x-3$$

$$30 = 5x \Rightarrow x = 6$$

80. Write $\frac{1}{3}(\log_5 x - 2\log_5 y)$ as a single logarithm with a coefficient of 1.

$$\frac{1}{3} \left(\log_5 \frac{x}{y^2} \right) = \log_5 \left(\frac{x}{y^2} \right)^{\frac{1}{3}}$$

$$= \log_5 \sqrt[3]{\frac{x}{y^2}}$$

82. Evaluate:

a) $\log_{10} 20 = \frac{\log 20}{\log 10} \approx 1.301$

b) $\log_5 25 = 2$

c) $\log_2 8 = 3$

84. The intensity (I) of a light source is inversely proportional to the square of the distance (d) from the source. If the intensity is 20 lumens at a distance of 5 ft, what is the intensity when the distance is 10 ft?

$I d^2$ is constant

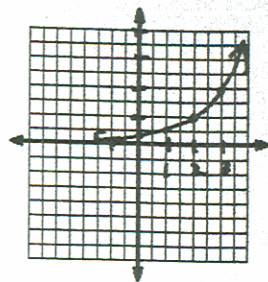
$$(20)(5)^2 = I(10)^2$$

$$500 = 100 I$$

$$I = 5 \text{ lumens}$$

76. Graph: $f(x) = 2^{x-2}$

x	y
0	$2^{-2} = \frac{1}{4}$
1	$2^{-1} = \frac{1}{2}$
2	$2^0 = 1$
3	$2^1 = 2$
-1	$2^{-3} = \frac{1}{8}$



79. Write $\log_5 \frac{x^3}{yz^4}$ in expanded form.

$$\log_5 x^3 - (\log_5 y + \log_5 z^4)$$

$$3 \log_5 x - \log_5 y - 4 \log_5 z$$

81. Solve: $5^x = 36$

$$\log 5^x = \log 36$$

$$x \log 5 = \log 36$$

$$x = \frac{\log 36}{\log 5} \approx 2.2266$$

83. Solve:

$$\log_5(3x) - \log_5(x^2 - 1) = \log_5 2 \quad x = 2$$

$$\log_5 \frac{3x}{x^2 - 1} = \log_5 2$$

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

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

$$(2x + 1)(x - 2) = 0$$

85. The profit (P) realized by a company varies directly as the number of items it sells (s). If the company makes a profit of \$6000 on the sale of 150 items, what is the profit if the company sells 2000 items?

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

reject

$\frac{P}{s}$ is constant

$$\frac{6000}{150} = \frac{x}{2000}$$

$$150x = (6000)(2000)$$

$$150x = 12,000,000$$

$$x = 80,000$$

$$P = \$80,000$$