

Name ANSWER KEY

Date _____

Show all work! Exact answers only unless the problem asks for an approximation.

These are important topics from previous courses that you must be comfortable doing before you can be successful in Honors PreCalculus.

If you find that you need some assistance, please feel free to Google or YouTube the concepts. Within the directions of each problem, you will see key words that you should be using in your research. I also recommend that you use the Desmos app for your phone or desmos.com on your computers to analyze the graph of functions if you do not have a graphing calculator.

1) Solve the linear equation.

$$\begin{aligned} 3(x+4) - 2(3x-1) &= 4x \\ 3x+12-6x+2 &= 4x \\ -3x+14 &= 4x \end{aligned}$$

$$-7x = -14$$

$$x = 2$$

2) Solve the linear equation.

$$\begin{aligned} 12(4+x) &= 6(2x+8) \\ 48+12x &= 12x+48 \\ 0 &= 0 \end{aligned}$$

ALL REALS
 $\mathbb{R}$

3) Solve the equation.

$$\begin{aligned} 24\left(7 - \frac{x}{8} = \frac{x}{6}\right) \\ 168 - 3x &= 4x \\ 168 &= 7x \end{aligned}$$

$$x = 24$$

4) Solve the equation.

$$\begin{aligned} \frac{2x+5}{-4} &= \frac{x-2}{3} \\ 6x+15 &= -4x+8 \\ 10x &= -7 \end{aligned}$$

$$x = -\frac{7}{10}$$

5) Solve the inequality & graph the solution set.

$$\begin{aligned} 2(3-x) &\geq 8 \\ 6-2x &\geq 8 \\ -2x &\geq 2 \\ x &\leq -1 \end{aligned}$$



6) Solve the inequality & graph the solution set.

$$\begin{aligned} 3x-7 &< 6x+20 \\ -3x &< 27 \\ x &> -9 \end{aligned}$$



7) Solve the inequality & graph the solution set.

$$\begin{aligned} 4 &\leq -3x+1 < 19 \\ 3 &\leq -3x < 18 \\ -1 &\geq x > -6 \end{aligned}$$



8) Solve the absolute value equation.

$$3|x - 4| + 2 = 20$$

$$3|x - 4| = 18$$

$$|x - 4| = 6$$

$$x - 4 = 6$$

$$x = 10$$

$$x - 4 = -6$$

$$x = -2$$

9) Solve the absolute value inequality & graph the solution set.

$$|x + 3| \leq 9$$

↑
CLOSED, INSIDE

$$x + 3 = 9$$

$$x = 6$$

$$x + 3 = -9$$

$$x = -12$$



10) Solve the absolute value inequality & graph the solution set.

$$|2x - 1| > 31$$

↑
OPEN, OUTSIDE

$$2x - 1 = 31$$

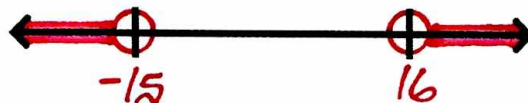
$$2x = 32$$

$$x = 16$$

$$2x - 1 = -31$$

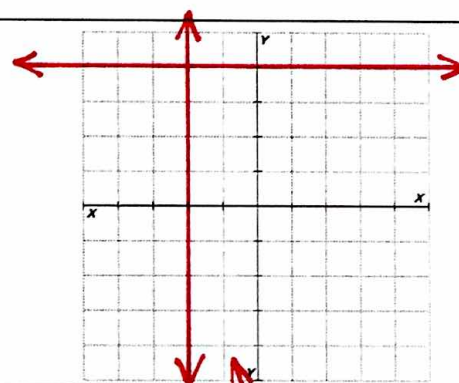
$$2x = -30$$

$$x = -15$$



11) Graph the linear functions.

$$y = 4 \text{ and } x = -2$$

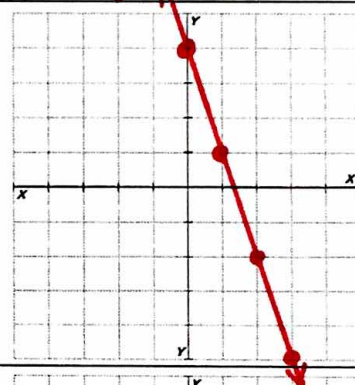


12) Graph the linear function.

$$6x + 2y = 8$$

$$2y = -6x + 8$$

$$y = -3x + 4$$

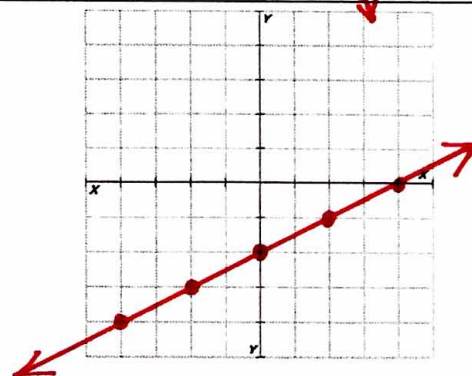


13) Graph the linear function.

$$3x - 6y = 12$$

$$-6y = -3x + 12$$

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

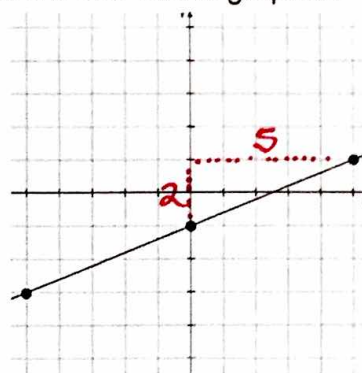


14) Write the equation in slope-intercept form and standard form for the line that is graphed.

Slope-intercept form $y = \frac{2}{5}x - 1$

Standard form $2x - 5y = 5$

$-5(-\frac{2}{5}x + y = -1)$



15) Write the equation in slope-intercept form and standard form for the line that is graphed.

$3 = -\frac{5}{2} \cdot 2 + b$

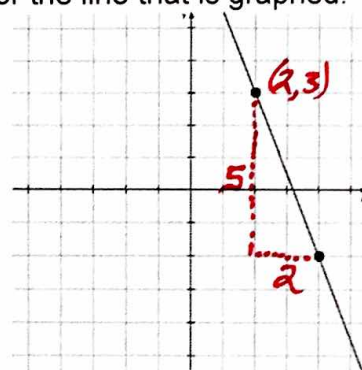
$3 = -5 + b$

$8 = b$

Slope-intercept form $y = -\frac{5}{2}x + 8$

Standard form $5x + 2y = 16$

$2(\frac{5}{2}x + y = 8)$



16) Find the slope-intercept equation for a line with the given properties.

Containing the points $(4, -4)$ & $(-6, 21)$

$\frac{21 - (-4)}{-6 - 4} = \frac{25}{-10} = -\frac{5}{2}$

$-4 = -\frac{5}{2} \cdot 4 + b$
 $-4 = -10 + b$

$b = 6$

$y = -\frac{5}{2}x + 6$

17) Find the slope-intercept equation for a line with the given properties.

Parallel to $y = -2x + 7$ & containing the point $(-7, 6)$

$6 = -2 \cdot (-7) + b$

$6 = 14 + b$

$b = -8$

$y = -2x - 8$

18) Find the slope-intercept equation for a line with the given properties.

Perpendicular to $y = 4x$ & containing the point $(-8, 9)$

$9 = -\frac{1}{4} \cdot (-8) + b$

$9 = 2 + b$

$b = 7$

$y = -\frac{1}{4}x + 7$

19) Find the zero of the linear function.

$f(x) = 5x + 14$

$0 = 5x + 14$

$5x = -14$

$x = -\frac{14}{5} = -2.8$

$(-\frac{14}{5}, 0)$

20) A taxi company charges \$3.20 plus \$1.15 per mile. Write a linear function that relates the cost C , in dollars, of riding the taxi for x miles. What is the cost of riding the taxi if the ride is 23 miles?

$C = 1.15x + 3.20$

$C(23) = \$29.65$

21) Simplify using properties of exponents.

$(4xy^7)(-3x^5y^2) = -12x^6y^9$

22) Simplify using properties of exponents.

$$\frac{18x^3y^7}{12xy^{10}} = \frac{3x^2}{2y^3}$$

23) Simplify using properties of exponents.

$$(-3x^5y^3)^4 = 81x^{20}y^{12}$$

24) Simplify using properties of exponents.

$$(4xy^7)^2(-3x^5y^2) = 16x^2y^{14} \cdot -3x^5y^2 = -48x^7y^{16}$$

25) Simplify using properties of exponents.

$$\frac{-8x^{-3}y^{-7}z^5}{12x^{-1}y^{10}z^{-6}} = \frac{-8x^4z^5z^6}{12x^3y^{10}y^7} = \frac{-2z^{11}}{3x^2y^{17}}$$

26) Rewrite the expression using rational exponent notation.

$$\sqrt[6]{x^4} = x^{4/6} = x^{2/3}$$

27) Rewrite the expression using radical notation.

$$7^{1/5} = \sqrt[5]{7^1} = \sqrt[5]{7}$$

28) Evaluate the expression without using a calculator.

$$3^{-4} = \frac{1}{3^4} = \frac{1}{81}$$

29) Evaluate the expression without using a calculator.

$$64^{2/3} = \left(\sqrt[3]{64}\right)^2 = 4^2 = 16$$

30) Evaluate the expression without using a calculator.

$$36^{-3/2} = \frac{1}{(\sqrt[2]{36})^3} = \frac{1}{6^3} = \frac{1}{216}$$

31) Multiply the polynomials.

$$(4x^3 - 7x - 8)(6x^2 + 5x - 9) = \begin{array}{r} 24x^5 + 20x^4 - 36x^3 \\ - 42x^3 - 35x^2 + 63x \\ - 48x^2 - 40x + 72 \\ \hline 24x^5 + 20x^4 - 78x^3 - 83x^2 + 23x + 72 \end{array}$$

32) Factor the polynomial.

$$12x^2 + 16xy - 4x^4 = 4x(3x + 4y - x^3) \text{ or } -4x(x^3 - 3x - 4y)$$

33) Factor the polynomial.

$$2x^2 - 5x - 12 = (2x + 3)(x - 4)$$

34) Factor the polynomial.

$$3x^2 - 37x + 12 = (3x - 1)(x - 12)$$

35) Factor the polynomial.

$$4x^2 + 20x + 25 = (2x + 5)(2x + 5) = (2x + 5)^2$$

36) Factor the polynomial.

$$3x^3 - 12x = 3x(x^2 - 4) = 3x(x - 2)(x + 2)$$

37) Factor the polynomial.

$$x^3 - 125 = (x - 5)(x^2 + 5x + 25)$$

DIFFERENCE OF CUBES: $(a - b)(a^2 + ab + b^2)$

38) Factor the polynomial.

$$8x^3 + 27 = (2x + 3)(4x^2 - 6x + 9)$$

SUM OF CUBES: $(a + b)(a^2 - ab + b^2)$

39) Factor the polynomial.

$$\begin{aligned} 2x^3 - x^2 - 18x + 9 &= x^2(2x - 1) - 9(2x - 1) = (2x - 1)(x^2 - 9) \\ &= (2x - 1)(x - 3)(x + 3) \end{aligned}$$

40) Factor the polynomial.

$$12y^3 + 8y^2 - 21y - 14 = 4y^2(3y + 2) - 7(3y + 2) = (4y^2 - 7)(3y + 2)$$

41) Factor the polynomial.

$$2z^4 + z^2 - 45 = (z^2 + 5)(2z^2 - 9)$$

42) Graph the quadratic function.

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

Identify the following:

Direction of Opening UP

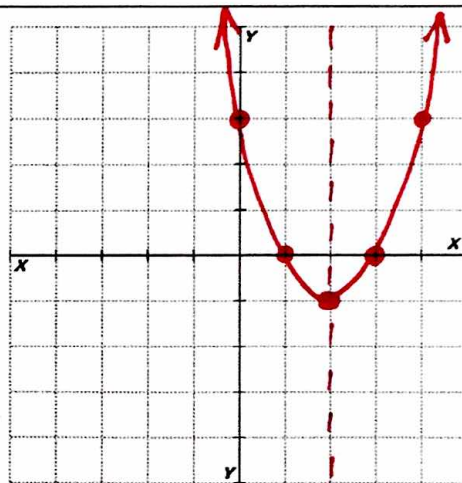
Y-intercept (0, 3)

$$x = \frac{-B}{2A}$$

Axis of Symmetry $x = 2$

Vertex (2, -1)

X-intercept(s) (1, 0)(3, 0)



$$x = 2$$

43) Graph the quadratic function.

$$y = -3x^2 - 6x - 1$$

Identify the following:

Direction of Opening Down

Y-intercept (0, -1)

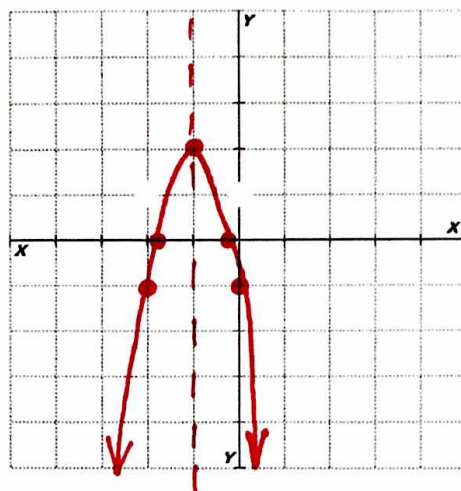
$$x = \frac{-B}{2A}$$

Axis of Symmetry $x = -1$

Vertex (-1, 2)

$$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

X-intercept(s) (-1.82, 0) (-0.18, 0)



44) Solve the quadratic equation.

$$x^2 = -2x - 5$$

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

$$x = \frac{-2 \pm \sqrt{-16}}{2} = \frac{-2 \pm 4i}{2} = -1 \pm 2i$$

45) Solve the quadratic equation.

$$3x^2 - 20x - 32 = 0$$

$$(3x + 4)(x - 8) = 0$$

$$x = -\frac{4}{3} \quad x = 8$$

46) Solve the quadratic equation.

$$(x - 5)^2 = 18$$

$$x - 5 = \pm \sqrt{18}$$

$$x = 5 \pm 3\sqrt{2}$$

47) Solve the radical equation.

$$5\sqrt{x+6} - 1 = 39$$

$$5\sqrt{x+6} = 40$$

$$\sqrt{x+6} = 8$$

$$x+6 = 64$$

$$x = 58$$

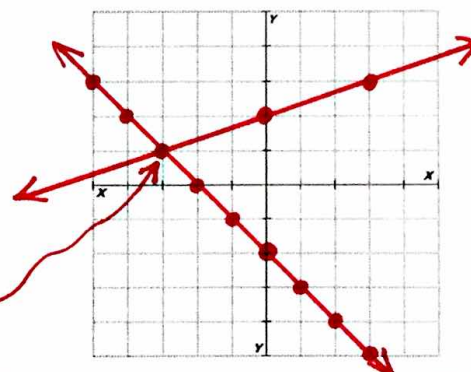
48) Solve the system of equations by graphing.

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

$$y = -x - 2$$

$$\begin{aligned} -3y &= -x - 6 \\ y &= \frac{1}{3}x + 2 \end{aligned}$$

$$(-3, 1)$$



49) Solve the system of equations.

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

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

$$2x - 5x + 1 = -2$$

$$-3x = -3$$

$$x = 1$$

$$y = 4$$

$$(1, 4)$$

50) Solve the system of equations.

$$\begin{cases} 4x + 3y = -2 \\ 3x + 2y = -3 \end{cases} \xrightarrow{+2} \begin{cases} 8x + 6y = -4 \\ -9x - 6y = 9 \end{cases} \xrightarrow{+} \begin{cases} -x = 5 \\ x = -5 \end{cases}$$

$x = -5$

$$-20 + 3y = -2 \implies 3y = 18 \implies y = 6$$

$(-5, 6)$

51) Simplify the radical.

$$\sqrt{128} = \sqrt{64 \cdot 2} = 8\sqrt{2}$$

52) Multiply the radicals and simplify.

$$\sqrt{20} \cdot \sqrt{45} = 2\sqrt{5} \cdot 3\sqrt{5} = 6 \cdot 5 = 30$$

53) Multiply the radicals and simplify.

$$3\sqrt{8} \cdot 2\sqrt{6} = 6 \cdot 2\sqrt{2} \cdot \sqrt{2} \sqrt{3} = 12 \cdot 2\sqrt{3} = 24\sqrt{3}$$

54) Add the radicals.

$$3\sqrt{8} + 5\sqrt{18} - \sqrt{98} = 6\sqrt{2} + 15\sqrt{2} - 7\sqrt{2} = 14\sqrt{2}$$

$4 \cdot 2 \quad 9 \cdot 2 \quad 49 \cdot 2$

55) Rationalize.

$$\frac{6}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{6\sqrt{3}}{3} = 2\sqrt{3}$$

56) Rationalize.

$$\frac{5\sqrt{7}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{5\sqrt{14}}{2}$$

57) Evaluate the function notation.

$$h(x) = 4x^2 - 3x + 11 \quad \text{Find } h(-3) = 56$$

$36 + 9 + 11$

58) Evaluate the function notation.

$$f(x) = \frac{x^3 - 337}{2x - 11} \quad \frac{6}{3} \quad \text{Find } f(7) = 2$$

59) Find the value of x in the function notation equation.

$$g(x) = -\frac{3}{5}x + 4 \quad \text{Find } x \text{ so that } g(x) = 10$$

$$10 = -\frac{3}{5}x + 4 \rightarrow 6 = -\frac{3}{5}x \rightarrow x = 6 \cdot -\frac{5}{3} = -10$$

60) Find the value of c .

$$f(-3) = -11 \text{ \& } f(x) = 2x^3 + x^2 - 7x + c$$
$$-11 = 2(-3)^3 + (-3)^2 - 7(-3) + c$$
$$-11 = -54 + 9 + 21 + c$$
$$-11 = -24 + c$$

61) Use the graph of $g(x)$ to answer the following questions.

A) Find $g(-9) = -3$

B) Find $g(4) = 0$

C) Find $g(8) = 2$

D) Find x so that $g(x) = 5$

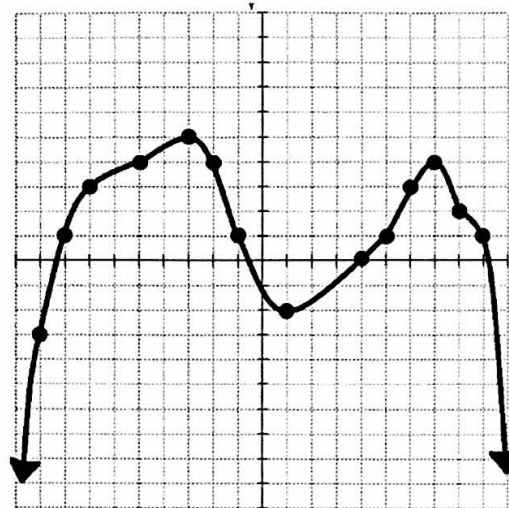
$x = -3$

E) Find x so that $g(x) = 4$

$x = 7, -2, -5$

F) Find x so that $g(x) = 1$

$x = 9, 5, -1, -8$



62) Find the distance between the points & the midpoint of the line segment joining the points.

$(2, -5)$ & $(-6, -9)$

$\sqrt{64 + 16} = \sqrt{80} = \sqrt{16 \cdot 5}$

Distance $4\sqrt{5}$

Midpoint $(-2, -7)$

63) Find the domain of the function.

$f(x) = \frac{4x^2 - 1}{x^2 - 9} = \frac{4x^2 - 1}{(x-3)(x+3)}$

$x \neq \pm 3$

64) Find the domain of the function.

$g(x) = \sqrt{x-5}$

$x \geq 5$

65) Find the domain of the function.

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

$x > -2$

66) Divide the polynomials.

$(3x^3 - 18x^2 + 25x - 6) \div (x - 4)$

$$\begin{array}{r|rrrr} 4 & 3 & -18 & 25 & -6 \\ & & 12 & -24 & 4 \\ \hline & 3 & -6 & 1 & -2 \end{array}$$

$3x^2 - 6x + 1$
REMAINDER = -2

67) Divide the polynomials.

$(x^4 + x^3 - 5x^2 - 15x - 18) \div (x^2 + 2x + 3)$

$x^2 - x - 6$

REMAINDER = 0

$$\begin{array}{r} x^2 - x - 6 \\ x^2 + 2x + 3 \overline{) x^4 + x^3 - 5x^2 - 15x - 18} \\ \underline{x^4 + 2x^3 + 3x^2} \\ -x^3 - 8x^2 - 15x \\ \underline{-x^3 - 2x^2 - 3x} \\ -6x^2 - 12x - 18 \\ \underline{-6x^2 - 12x - 18} \\ 0 \end{array}$$

68) Perform the indicated operation and simplify.

$$\frac{5}{x^2y} + \frac{-7x}{5y^2} = \frac{25y}{5x^2y^2} + \frac{-7x^3}{5x^2y^2} = \frac{25y-7x^3}{5x^2y^2}$$

69) Perform the indicated operation and simplify.

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

70) Solve the equation.

$$12y \left(\frac{2}{3y} + \frac{5}{6y} = \frac{3}{4} \right) \rightarrow 8 + 10 = 9y$$

$$18 = 9y$$

$$y = 2$$

71) Solve the equation.

$$(x+2)(x+3) \left(\frac{3}{x^2+5x+6} + \frac{x-1}{x+2} = \frac{7}{x+3} \right) \rightarrow 3 + x^2 - x + 3x - 3 = 7x + 14$$

$$x^2 - 5x - 14 = 0$$

$$(x-7)(x+2) = 0$$

$$x = 7 \quad x = -2$$

EXTRANEUS

72) Find the sum of the series.

$$S_n = \frac{n}{2}(2a_1 + d(n-1))$$

$$21 + 25 + 29 + 33 + \dots; n = 26$$

ARITHMETIC

$d = 4$

$$S_{26} = \frac{26}{2}(2 \cdot 21 + 4(26-1)) = 1846$$

73) Find the sum of the series.

$$S_n = \frac{a_1(1-r^n)}{1-r}$$

$$2 + 6 + 18 + 54 + \dots; n = 13$$

GEOMETRIC

$r = 3$

$$S_{13} = \frac{2(1-3^{13})}{1-3} = 1,594,322$$

74) Find the sum of the series.

$$S_{\infty} = \frac{a_1}{1-r}$$

$$20480 + 5120 + 1280 + 320 + \dots$$

INFINITE GEOMETRIC

$r = 1/4$ CONVERGES

$$S_{\infty} = \frac{20480}{1-1/4} = 27,306 \frac{2}{3}$$

75) Find the sum of the series.

$$6 + 12 + 24 + 48 + \dots$$

INFINITE GEOMETRIC

$r = 2$

NO SUM

76) Find the sum of the series.

$$S_n = \frac{n}{2}(a_1 + a_n)$$

$$29 + 22 + 15 + 8 + \dots + (-160)$$

ARITHMETIC

$d = -7$

$$S_{28} = \frac{28}{2}(29 + (-160)) = -1834$$

$$a_n = a_1 + d(n-1)$$

$$-160 = 29 - 7(n-1)$$

$$28 = n$$

77) Find the sum of the series.

$$S_n = \frac{a_1 - a_n \cdot r}{1-r}$$

$$12288 + (-6144) + 3072 + (-1536) + \dots + \left(-\frac{3}{2}\right)$$

GEOMETRIC

$r = -1/2$

$$S_{14} = \frac{12288 - (-3/2)(-1/2)}{1 - (-1/2)} = 8191 \frac{1}{2}$$

$$a_n = a_1 \cdot r^{n-1}$$

$$-3/2 = 12288(-1/2)^{n-1}$$

$$n = 14$$

- 78) Find the value of c that makes the expression a perfect square trinomial then write the expression as the square of a binomial.

$$x^2 - 7x + c$$

$$c = 49/4$$

$$x^2 - 7x + \left(-\frac{7}{2}\right)^2 = x^2 - 7x + \frac{49}{4} = \left(x - \frac{7}{2}\right)\left(x - \frac{7}{2}\right) = \left(x - \frac{7}{2}\right)^2$$

- 79) Write the equation in standard form and classify the conic section. Identify the important characteristics of the graph.

$$x^2 + 16y^2 + 10x - 64y + 25 = 0$$

$$(x^2 + 10x) + (16y^2 - 64y) = -25$$

$$(x^2 + 10x + 25) + 16(y^2 - 4y + 4) = -25 + 25 + 64$$

$$(x+5)^2 + 16(y-2)^2 = 64 \rightarrow \frac{(x+5)^2}{64} + \frac{(y-2)^2}{4} = 1$$

ELLIPSE

MAJOR AXIS = 16 (HORIZONTAL)

MINOR AXIS = 4 (VERTICAL)

CENTER (-5, 2)

VERTICES
(-5, 4) (-5, 0)
(-13, 2) (3, 2)

- 80) Write the equation in standard form and classify the conic section. Identify the important characteristics of the graph.

$$x^2 + y^2 + 4x - 6y - 87 = 0$$

$$(x^2 + 4x + 4) + (y^2 - 6y + 9) = 87 + 4 + 9$$

$$(x+2)^2 + (y-3)^2 = 100$$

CIRCLE

CENTER (-2, 3)

RADIUS = 10