

# CHAPTER 6 REVIEW

## Section 1: Completing the Square

1) For each parabola in standard form, find the max/min point by completing the square and finding the vertex.

a)  $y = x^2 + 4x + 5$

$$y = (x^2 + 4x + 4) - 4 + 5$$

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

The vertex is:  $(-2, 1)$

Is this a max or min point? min

b)  $y = x^2 - 10x + 7$

$$y = (x^2 - 10x + 25) - 25 + 7$$

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

The vertex is:  $(5, -18)$

Is this a max or min point? min

c)  $y = x^2 + 2x + 6$

$$y = (x^2 + 2x + 1) - 1 + 6$$

$$y = (x+1)^2 + 5$$

$(-1, 5)$       min

The vertex is: \_\_\_\_\_

Is this a max or min point? \_\_\_\_\_

d)  $y = -x^2 + 4x - 4$

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

$$y = -(x-2)^2$$

The vertex is: (2, 0)

Is this a max or min point?: max

e)  $y = 3x^2 - 30x + 73$

$$y = 3(x^2 - 10x + 25) - 75 + 73$$

$$y = 3(x-5)^2 - 2$$

The vertex is: (5, -2)

Is this a max or min point?: min

f)  $y = 2x^2 - 8x - 7$

$$y = 2(x^2 - 4x + 4) - 15$$

$$y = 2(x-2)^2 - 15$$

The vertex is: (2, -15)

Is this a max or min point?: min

2) What is the vertex, direction of opening, and number of roots (x-intercepts) for each of the following quadratic equations?

a)  $y = 3(x - 2)^2 - 4$

vertex =  $(2, -4)$

direction of opening = up

number of roots = 2

b)  $y = -2(x + 4)^2 - 2$

vertex =  $(-4, -2)$

direction of opening = down

number of roots = 0

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

vertex =  $(-4, 0)$

direction of opening = up

number of roots = 1

### Section 2: Solving By Factoring

3) Solve each of the following quadratic equations by factoring:

a)  $x^2 + 4x - 21 = 0$

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

$$\begin{array}{l} x = -7 \\ x = 3 \end{array}$$

b)  $-x^2 + 5x + 6 = 0$  (factor out the negative first!)

$$-(x^2 - 5x - 6) = 0$$

$$-(x-6)(x+1) = 0$$

$$\begin{array}{l} x = 6 \\ x = -1 \end{array}$$

c)  $x^2 + 5x = -4$  (set equal to 0)

$$x^2 + 5x + 4 = 0$$

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

$$\boxed{x = -4} \quad \boxed{x = -1}$$

d)  $x^2 + x - 6 = 0$

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

$$\boxed{x = -3} \quad \boxed{x = 2}$$

e)  $6x^2 + x = 1$

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

$$6x^2 + 3x - 2x - 1 = 0$$

$$3x(2x+1) - 1(2x+1) = 0$$

$$(2x+1)(3x-1) = 0$$

f)  $5x^2 - 19x - 4 = 0$

$$5x^2 - 20x + x - 4 = 0$$

$$5x(x-4) + 1(x-4) = 0$$

$$(5x+1)(x-4) = 0$$

$$\boxed{x = -\frac{1}{5}} \quad \boxed{x = 4}$$

$$\boxed{x = -\frac{1}{2}} \quad \boxed{x = \frac{1}{3}}$$

g)  $2x^2 + 5 = -11x$

$$2x^2 + 11x + 5 = 0$$

$$2x^2 + 10x + x + 5 = 0$$

$$2x(x+5) + 1(x+5) = 0$$

$$(x+5)(2x+1) = 0$$

$$\boxed{x = -5} \quad \boxed{x = -\frac{1}{2}}$$

$$h) 4a^2 + 12a = -9 \quad 4a^2 + 12a + 9 = 0$$

$$(2a + 3)^2 = 0$$

$$a = -3/2$$

$$i) -2x^2 - 5x = 2$$

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

$$-(2x^2 + 4x + x + 2) = 0$$

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

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

$$x = -2$$

$$x = -1/2$$

### Section 3: Solve Using the Quadratic Formula

4) Solve each of the following quadratic expressions using the quadratic formula (find the approximate roots):

$$a) x^2 + 7x + 5 = 0$$

$$x = \frac{-7 \pm \sqrt{49 - 4(1)(5)}}{2(1)}$$

$$x = \frac{-7 \pm \sqrt{29}}{2}$$

$$x = -0.81 \quad x = -6.19$$

$$b) 3x^2 - 6x - 5 = 0$$

$$x = \frac{6 \pm \sqrt{36 - 4(3)(-5)}}{6}$$

$$x = \frac{6 \pm \sqrt{96}}{6}$$

$$x = 2.63 \quad x = -0.63$$

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

c)  $x^2 - 5x = 2$

$$x = \frac{5 \pm \sqrt{25 - 4(1)(-2)}}{2}$$

$$x = \frac{5 \pm \sqrt{25+8}}{2}$$

$$x = \frac{5 \pm \sqrt{33}}{2}$$

$$x = 5.37$$

$$x = -0.37$$

d)  $0 = -2x^2 + 4x + 7$

$$x = \frac{-4 \pm \sqrt{16 - 4(-2)(7)}}{2(-2)}$$

$$x = \frac{-4 \pm \sqrt{72}}{-4}$$

$$x = -1.12$$

$$x = 3.12$$

e)  $0 = 3x^2 + 6x + 4$

$$x = \frac{-6 \pm \sqrt{36 - 4(3)(4)}}{2(3)}$$

$$x = \frac{-6 \pm \sqrt{-12}}{6}$$

NO ROOTS

f)  $4x^2 - 12x + 9 = 0$

$$x = \frac{12 \pm \sqrt{44 - 4(4)(9)}}{2(4)}$$

$$x = \frac{12 \pm \sqrt{0}}{8}$$

$$x = 1.5$$

g)  $16x^2 + 24x = -9$      $16x^2 + 24x + 9 = 0$

$$x = \frac{-24 \pm \sqrt{576 - 4(16)(9)}}{32}$$

$$x = \frac{-24 \pm \sqrt{0}}{32}$$

$$x = -0.75$$

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

$$x = \frac{2 \pm \sqrt{4 - 4(1)(3)}}{2}$$

$$x = \frac{2 \pm \sqrt{-8}}{2}$$

No Roots

5) Sketch the graph of the following parabolas. Label the vertex and x-intercepts (you must solve using any method, then find the axis of symmetry, then the vertex) (Extra – Pg.316 #7)

a)  $y = x^2 + 8x + 12$

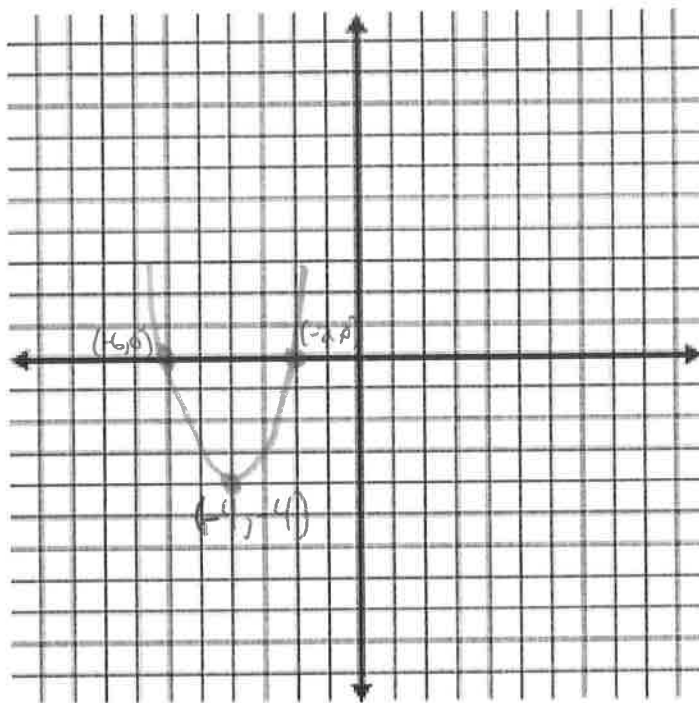
$$0 = (x+2)(x+6)$$

$$x = -2 \quad x = -6$$

a.o.s.  $x = \frac{-8}{2} = -4$

$$y_{\text{vertex}} = (-4)^2 + 8(-4) + 12 = -4$$

vertex  $(-4, -4)$



b)  $y = 3x^2 + 12x - 15$

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

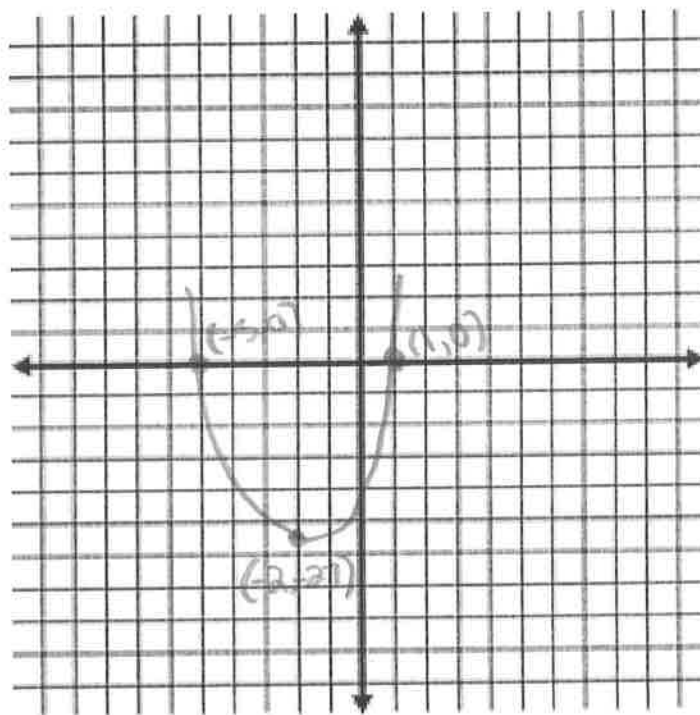
$$y = 3(x+5)(x-1)$$

$$x = -5 \quad x = 1$$

a.o.s.  $x = \frac{-4}{2} = -2$

$$y_{\text{vertex}} = 3(-2)^2 + 12(-2) - 15 = -27$$

vertex  $(-2, -27)$

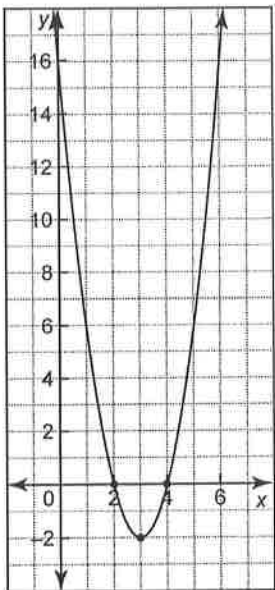




**Section 4: Write the Equation in standard form (Extra – Pg.289#6,7)**

6) Write the equation in standard form for each graph (You will first have to write it in factored form, then expand using FOIL):

a)



$x$ -int:  $2$  and  $4$

point:  $(3, -2)$   
 $x$   $y$

$$y = a(x-r)(x-s)$$

$$-2 = a(3-2)(3-4)$$

$$-2 = a(1)(-1)$$

$$a = 2$$

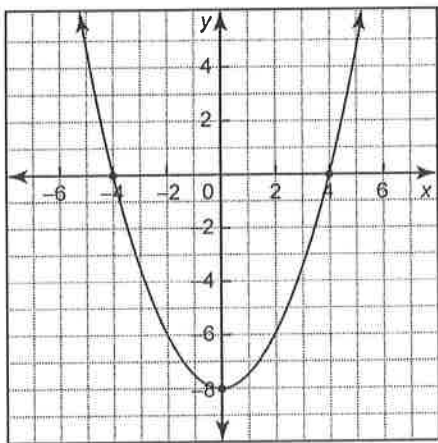
$$y = 2(x-2)(x-4)$$

$$y = 2(x^2 - 6x + 8)$$

$$y = 2x^2 - 12x + 16$$

The equation in standard form is:  $y = 2x^2 - 12x + 16$

b)



$x$ -int:  $-4$  and  $4$

point:  $(0, -8)$

$$-8 = a(0+4)(0-4)$$

$$-8 = a(4)(-4)$$

$$-8 = a(-16)$$

$$a = 1/2$$

$$y = 1/2(x+4)(x-4)$$

$$y = 1/2(x^2 - 16)$$

$$y = 1/2x^2 - 8$$

The equation in standard form is: \_\_\_\_\_

**Section 5: Applications (extra practice Pg. 319#15,16)**

7) A toy rocket is launched from a platform that is 2 m off the ground at an initial velocity of 17.4 m/s. The height,  $h$ , in metres, of the rocket  $t$  seconds after it is launched is given by the equation  $h = -4.9t^2 + 17.4t + 2$ .

- a) When will the rocket land (find the x-intercepts using the quadratic formula)?  
b) What is the maximum height (what is the y-coordinate of the vertex)?

$$a) \quad x = \frac{-17.4 \pm \sqrt{(17.4)^2 - 4(-4.9)(2)}}{2(-4.9)}$$

$$x = -0.11$$

$$x = 3.66$$

The rocket will land after 3.66 seconds

$$b) \quad x_{\text{vertex}} = \frac{-b}{2a} = \frac{-17.4}{2(-4.9)} = 1.78$$

$$y_{\text{vertex}} = -4.9(1.78)^2 + 17.4(1.78) + 2$$
$$=$$

Max height is 17.45 m.

Do you want 2 bonus marks on your test? Ask how.