Key

Algebra 2 Chapter 5 Pre-Test

1.) (5 pts total, 2.5 pts each) Rewrite each function in standard form. Indicate whether the function is a quadratic.

a) $(x - 7)(x - 7)$

$x^2 - 14x + 49$ yes

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

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

$2x^2 + 8x + 4 - 2x^2$

$= 8x + 4$ no

2.) (5 pts) Find a quadratic model for the following set of values:

$(-4, 8), (-1, 5), (1, 13)$

$y = ax^2 + bx + c$

$y = x^2 + 4x + 8$

$5 = a(-1)^2 + b(-1) + c$

$5 = a - b + c$

$13 = a(1)^2 + b(1) + c$

$13 = a + b + c$

$8 = a(-4)^2 + (4)(-4) + c$

$8 = 16a - 16 + c$

$+16 \quad +16$

$24 = 16a + c$

$5 = a - b + c$

$-(13 = a + b + c)$

$-13 = -a - b - c$

$-8 = -2b$

$\frac{-8}{-2} = \frac{-2b}{-2}$

$b = 4$

$13 = a + 4 + c$

$-4 \quad -4$

$9 = a + c$

$-9 = a + c$

$\frac{15}{15} = \frac{15a}{15}$

$a = 1$

$9 = 1 + c$

$-1 \quad -1$

$8 = c$

3.) (10 pts total, 5 pts each) Graph each parabola. Label the vertex and axis of symmetry.

a) $x^2 - 4x + 10$

$a = 1 \quad b = -4 \quad c = 10$

$\frac{-b}{2a}$

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

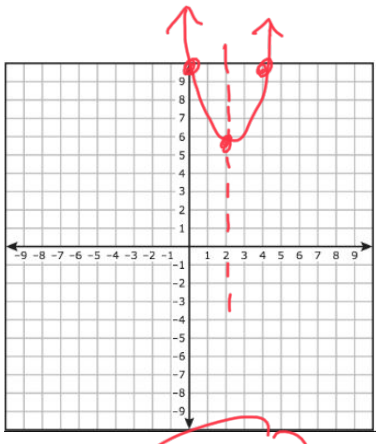
$(2)^2 - 4(2) + 10$

$4 - 8 + 10$

$-4 + 10$

6

Vertex: $(2, 6)$



line of symmetry = $x = 2$

b) $2x^2 + 12x + 17$

$h = \frac{-b}{2a}$

$\frac{-12}{2(2)} = \frac{-12}{4} = -3$

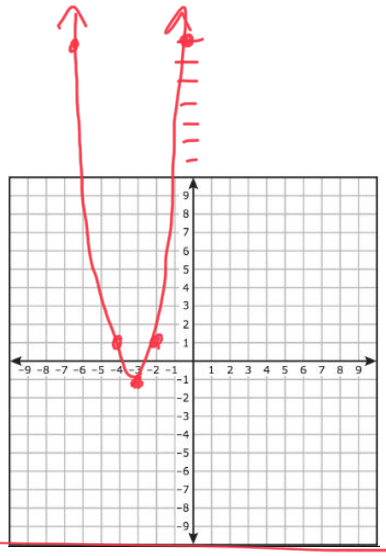
$2(-3)^2 + 12(-3) + 17$

$2(9) - 36 + 17$

$18 - 36 + 17$

$-18 + 17 = -1$

vertex: $(-3, -1)$



line of symmetry: $x = -3$

4.) (20 pts total, 5 pts each) Factor each expression.

a) $x^2 + 5x - 14$

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

$7 * -2 = -14$

$7 + -2 = 5$

b) $x^2 + 7x + 12$

$(x + 4)(x + 3)$

$4 * 3 = 12$

$4 + 3 = 7$

c) $2x^2 - 13x + 15$

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

$-10x + (-3x)$

$= -13x$

	$2x$	-3
x	$2x^2$	$-3x$
-5	$-10x$	15

d) $3x^2 - 5x - 12$

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

$-9x + 4x = -5x$

	$3x$	$+4$
x	$3x^2$	$+4x$
-3	$-9x$	-12

5.) (10 pts total, 2.5 pts each) Evaluate the discriminant of the equation. Indicate the number of real roots for each.

discriminant = $b^2 - 4ac$

a) $x^2 - 4x + 4$

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

$16 - 16 = 0$

1 real root

b) $-2x^2 + 6x - 14$

$b^2 - 4ac$

$6^2 - 4(-2)(-14)$

$36 - 4(28) = 36 - 112 = -76$

negative means 0 real roots

c) $x^2 + 9x + 18$

$b^2 - 4ac$

$9^2 - 4(1)(18) = 81 - 72 = 9$

positive means 2 real roots

d) $2x^2 + 11x - 21$

$b^2 - 4ac$

$(11)^2 - 4(2)(-21)$

$121 - 4(-42)$

$121 + 168 = 289$

positive means 2 real roots

6.) (15 pts total, 7.5 pts each) Solve using the Quadratic Equation.

a) $x^2 = 3x + 2$

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

$-3x-2 \quad -3x-2$

$\frac{-b \pm \sqrt{b^2-4ac}}{2a} \qquad \frac{-(-3) \pm \sqrt{(-3)^2-4(1)(-2)}}{2(1)}$

$\frac{3 \pm \sqrt{9+8}}{2} = \boxed{\frac{3 \pm \sqrt{17}}{2} \quad \frac{3+\sqrt{17}}{2} \text{ and } \frac{3-\sqrt{17}}{2}}$

b) $3x^2 - 5x = -12$

$3x^2 - 5x + 12$

$+12 \quad +12$

$\frac{-b \pm \sqrt{b^2-4ac}}{2a} \qquad \frac{-(-5) \pm \sqrt{(5)^2-4(3)(12)}}{2(3)}$

$\frac{5 \pm \sqrt{25-144}}{6} = \boxed{\frac{5 \pm \sqrt{119}}{6} = \frac{5+\sqrt{119}}{6} \text{ and } \frac{5-\sqrt{119}}{6}}$

7.) (15 pts total, 7.5 pts each) Place each equation in vertex form by completing the square. Please show all your work.

a) $x^2 = 5x + 14$

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

$-5x-14 \quad -5x-14$

$(x^2 - 5x) - 14 \qquad \left(\frac{5}{2}\right)^2 = \frac{25}{4}$

$\left(x^2 - 5x + \frac{25}{4}\right) - 14 - \frac{25}{4} \qquad \left(x^2 - 5x + \frac{25}{4}\right) - \frac{81}{4}$

$\searrow \downarrow \swarrow$

$\left(x^2 - 5x + \frac{25}{4}\right) - \frac{56}{4} - \frac{25}{4} \qquad \boxed{\left(x - \frac{5}{2}\right)^2 - \frac{81}{4}}$

b) $2x^2 + 6x - 7 = 0$

$(2x^2+6x)-7=0$

$2(x^2+3x)-7=0$

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

$\frac{9}{4}$

$2\left(x^2+3x+\frac{9}{4}\right)-7-2\left(\frac{9}{4}\right)$

$2\left(x^2+3x+\frac{9}{4}\right)-7-\frac{18}{4}$

$2\left(x^2+3x+\frac{9}{4}\right)-\frac{28}{4}-\frac{18}{4}$

$2\left(x^2+3x+\frac{9}{4}\right)-\frac{46}{4}$

$2\left(x^2+3x+\frac{9}{4}\right)-\frac{23}{2}$

$\left(x+\frac{3}{2}\right)^2-\frac{23}{2}$

8.) (20 pts total, 10 pts each) Graph each equation **completely**. Plot all roots, intercepts, and the vertex.

a) $x^2 + 6x + 9$

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

$-\frac{b}{2a}$

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

$x+3=0$ $\quad x+3=0$

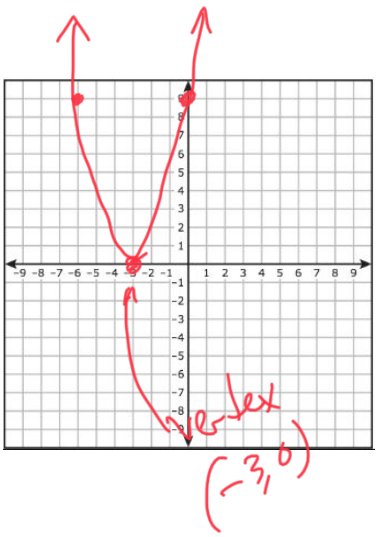
$-3\ -3 \quad -3\ -3$

$x=-3 \quad x=-3$

$(-3)^2+6(-3)+9$

$9-18+9$

$-9+9=0$



b) $x^2 - 4x - 5$

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

$-\frac{b}{2a}$

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

$x-5=0$ $\quad x+1=0$

$+5\ +5 \quad -1\ -1$

$x=5 \quad x=-1$

$(2)^2-4(2)-5$

$4-8-5$

$-4-5=-9$