Algebra 2 – Unit 2 Review – Quadratic Functions Name : KEY

1. I can find the vertex, axis of symmetry, and y-intercept for each function. (Hint: Determine which form each quadratic is in, then pick the appropriate strategy for finding the different characteristics, i.e. what should you find ***first***?)

$x = \frac{-b}{2a} = \frac{-(-12)}{2(3)} = \frac{12}{6} = 2$

a. $f(x) = 3x^2 - 12x + 5$

$f(2) = 3(2)^2 - 12(2) + 5$

$12 - 24 + 5$

Vertex: (2, -7) Axis of Symmetry: x = 2 y-intercept: 5

x = 0

b. $f(x) = (x-3)^2 + 7$

Vertex: (3, 7) Axis of Symmetry: x = 3 y-intercept: 16

x = 0

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

$L.O.S. = \frac{p+q}{2}$

Vertex: (1.5, -18.75) Axis of Symmetry: x = 3/2 y-intercept: -12

x = 0

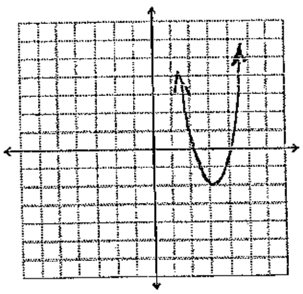
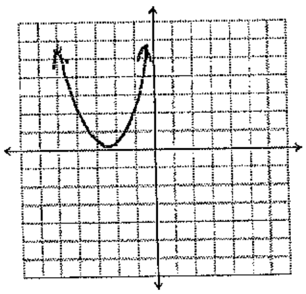
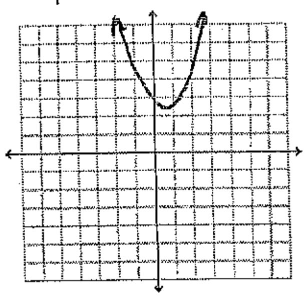
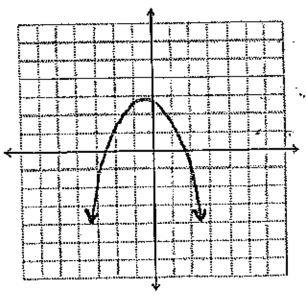
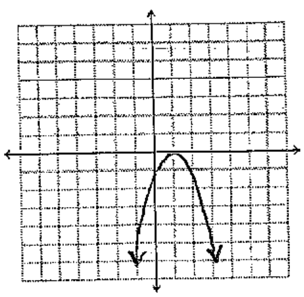
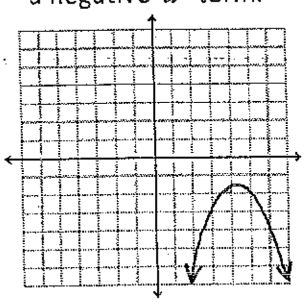
2. Given a quadratic function in the form $f(x) = ax^2 + bx + c$, I can explain the effect on the graph if:

a increases.	graph narrows as absolute value of a increases
a decreases.	graph is stretched (flattens) as |a| decreases.
$a < 0$.	graph flips so that it opens downward
$b < 0$.	axis of symmetry x > 0
$b = 0$.	axis of symmetry is the vertical axis
c increases.	y-intercept gets higher on the axis
c decreases.	y-intercept gets lower on the axis.

3. I can explain how to change a quadratic function from one form to another:

Change	Explanation	Do it!!
Standard to Intercept:	Factor – Greatest Common Factor first!!	$f(x)=2x^2-10x-28$ $f(x)=2(x^2-5x-14)$ $f(x)=2(x-7)(x+2)$
Standard to Vertex:	Complete the square	$f(x)=x^2-8x+19$ $f(x)=x^2-8x+\underline{16}+19\,\underline{-16}$ $f(x)=(x-4)^2+3$
Vertex to Standard:	Expand (Multiply)	$f(x)=-2(x+1)^2+3$ $f(x)=-2(x^2+2x+1)+3$ $f(x)=-2x^2-4x+1$
Intercept to Standard:	Expand (Multiply – FOIL First)	$f(x)=3(x-2)(x+1)$ $f(x)=3(x^2-2x+x-2)$ $f(x)=3x^2-3x-6$

4. I can draw the graph of a quadratic equation that has:

two real solutions and a positive a term. 	one real solution and a positive a term. 	no real solutions (two imaginary solutions) and a positive a term. 
Two real solutions and a negative a term. 	one real solution and a negative a term. 	no real solutions (two imaginary solutions) and a negative a term. 

5. I can solve quadratic equations using any method ***and explain the reason for choosing that method.***

a. $x^2 - 4 = 21$

$x^2 = 25$

$x = \pm 5$

no "b" term, so use square roots (isolate x^2 first)

b. $5x^2 + 3x + 2 = 0$

$$\frac{-3 \pm \sqrt{3^2 - 4(5)(2)}}{10}$$

$$\frac{-3 \pm \sqrt{-31}}{10}$$

$$\frac{-3 \pm i\sqrt{31}}{10}$$

has a "b" term, does not factor — use quadratic formula.

c. $x^2 - 13x + 42 = 0$

$(x-7)(x-6) = 0$

$x = 7$ or $x = 6$

factors nicely

$b^2 - 4ac$

6. I can use the ***discriminant*** to determine the nature of the solutions to a quadratic equation. For the following equations, identify the discriminant and state the number and nature of the solutions:

a. $y = 3x^2 + 2x + 7$

$2^2 - 4(3)(7)$

$4 - 84$

-80

no real solutions
two imaginary solutions

b. $y = 2x^2 - 8x + 8$

$(-8)^2 - 4(2)(8)$

$64 - 64$

0

one real solution (double root)

c. $y = 3.785x^2 - 2.25x - 11.625$

$(-2.25)^2 - 4(3.785)(-11.625)$

$5.0625 + 176.0025$

181.065

two real solutions

7. A pumpkin is launched with an initial velocity, v of 27.6 m/s from a trebuchet that releases the pumpkin at a height of 15.5 meters. The equation of the object's height h at a time t seconds after launch is $h(t) = -4.9t^2 + 27.6t + 15.5$. When does the pumpkin to strike the ground (in seconds)?

$0 = -4.9t^2 + 27.6t + 15.5$

$$\frac{-27.6 \pm \sqrt{(27.6)^2 - 4(-4.9)(15.5)}}{2(-4.9)} = \frac{-27.6 \pm 32.64}{-9.8} = 6.15 \text{ seconds}$$

(ignore extraneous answer)

8. Mr. Lock is unwisely walking along an unprotected rocky cliff 4400 feet high when he slips on some loose gravel and tumbles over the side. Assuming that there are no rocky obstacles for Mr. Lock to bounce upon that would slow his descent or cause a severe head wound and unconsciousness, how long does he have to contemplate the function representing his fall ($h(t) = -16t^2 + 4400$), his poor judgment, and his subsequent demise?

$$h = -16t^2 + 4400$$
$$16t^2 = 4400$$
$$t^2 = 275$$
$$t = 16.58 \text{ seconds}$$

9. The path of a place kicked football can be modeled by the function $y = -0.026x^2 + 1.196x$ where x is the horizontal distance (in yards) and y is the corresponding height (in yards).

a. How far is the football kicked? (What distance has it travelled horizontally when it hits the ground $y=0$?)

$$0 = -0.026x^2 + 1.196x \qquad -b \pm \sqrt{b^2 - 4ac} \leftarrow c = 0$$

$$\frac{-b \pm \sqrt{b^2}}{2a} = \frac{-b \pm b}{2a} = \frac{-2(1.196)}{2(-.026)} = \underline{46 \text{yds}}$$

b. What is the football's maximum height?

$$\text{L.O.S.} = \frac{-1.196}{2(-.026)} = 23 \rightarrow y = -0.026(23)^2 + 1.196(23)$$

max height $= 13.75$ meters