Practice Test – Quadratics

Algebra 2

SHOW ALL WORK!

Name KEY

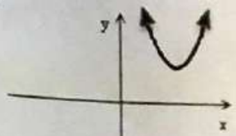
Date________ Period ____

Selected Response

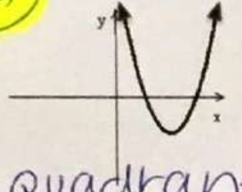
1. Which graph below best matches the equation $y = x^2 - 6x + 7$?

1) B

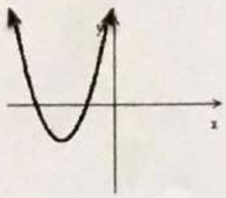
A)



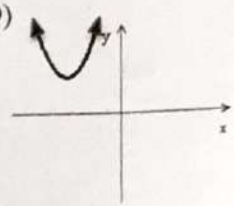
B)



C)



D)



vertex $(3, -2)$ aka quadrant 4!

use $x = \frac{-b}{2a}$ for x-coordinate of vertex.

Then plug into equation for y.

2. Solve $x^2 + 3x = 10$.

2) $x = 2$, $x = -5$

$x^2 + 3x - 10 = 0$

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

$x - 2 = 0$ or $x + 5 = 0$

$\boxed{x = 2}$ & $\boxed{x = -5}$

3. Solve: $9x^2 - 10x - 5 = 0$ *NOT factorable. Use quadratic formula

3) $\frac{5 \pm \sqrt{7}}{9}$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{10 \pm \sqrt{280}}{18} = \frac{10 \pm 2\sqrt{7}}{18} = \boxed{\frac{5 \pm \sqrt{7}}{9}}$$

4. Yazmin is solving a quadratic equation, and gets to the step shown below? At this point, which of the following statements can Yazmin assume? (Select ALL that apply.)

a) $x = \frac{-3 \pm \sqrt{-2}}{8}$ ← negative means complex! ± means 2!

A) There is only one real solution. X

B) The graph of the original function does not cross the x-axis. ✓

C) There are two real solutions. X

D) There are two complex solutions.

b) $x = \frac{-3 \pm \sqrt{2}}{8}$ ← discriminant is positive meaning 2 REAL solutions.

A) There is only one real solution. X

B) The graph of the original function does not cross the x-axis. X

C) There are two real solutions. ✓

D) There are two complex solutions. X

c) What number would have to be under the radical so there is only one real solution?

A) positive

B) negative

C) zero

D) All of the above

discriminant = 0

Practice Test –

Quadratics Algebra 2

SHOW ALL WORK!

Name____________________

Date__________**Period** ____

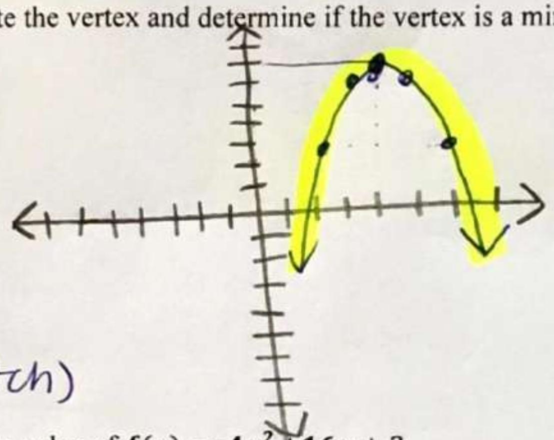
5. Graph the following function. State the vertex and determine if the vertex is a minimum or a maximum.

$f(x) = -(x-4)^2 + 7$

vertex $(4, 7)$

maximum.

$a = -1$ (neg. vertical stretch)



6. Determine maximum or a minimum value of $f(x) = -4x^2 + 16x + 2$

6) C

A) minimum; $f(x) = 18$ ✗ B) minimum; $f(x) = 2$ ✗

C) maximum; $f(x) = 18$ D) maximum; $f(x) = 2$

negative $a \Rightarrow \cap \Rightarrow$ maximum vertex. , Find vertex $x = \frac{-b}{2a}$ & y. $(2, 18)$

↑ y-value or $f(x) = 18$.

7. Simplify: $(2 - 6i) - (-6 + 7i)$.

$\boxed{8 - 13i}$

8. Multiply: $(3 - 4i)^2$

$\boxed{-7 - 24i}$

9. Simplify

$$\frac{4}{5+2i}\left(\frac{5-2i}{5-2i}\right) = \boxed{\frac{20-8i}{29}}$$

Practice Test –

Quadratics Algebra 2

SHOW ALL WORK!

Name______________

Date__________ Period ____

10. Write $y = x^2 + 6x + 4$ in vertex form.

$a=1 \quad b=6 \quad c=4$

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

$y = (-3)^2 + 6(-3) + 4$

$y = -5$

vertex $(-3,-5)$

$y = a(x-h)^2 + k$

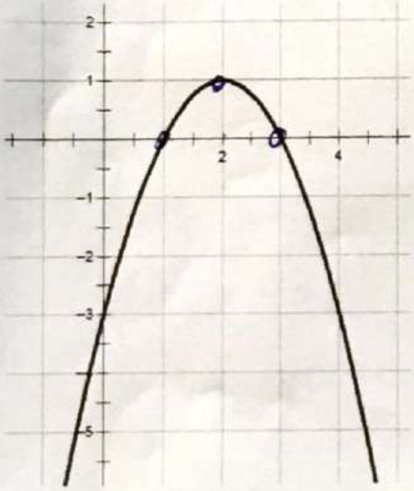
$y = 1(x - -3)^2 - 5$

$\boxed{y = (x+3)^2 - 5}$

~~11. What is the inverse of $f(x) = x^2 + 8$?~~

~~11)~~

12. Identify the function given in the graph below. List the function in three different forms: Factored Form, Vertex Form, and Standard Form.



vertex form $y = (x-2)^2 + 1$

Factored form $y = (x-1)(x-3)$

standard form $y = x^2 - 4x + 3$

Practice Test – Quadratics **Calculator OK** **Name**________________________

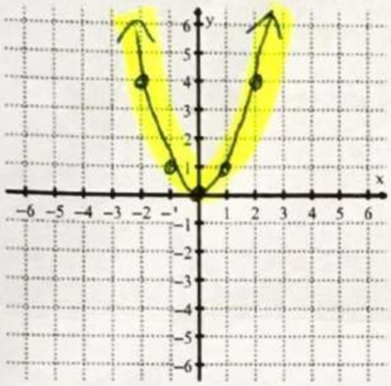
Algebra 2 **SHOW ALL WORK!** **Date** __________ **Period** ____

Free Response

13-16) Given $f(x) = x^2$ (5 points of precision for each parabola!)

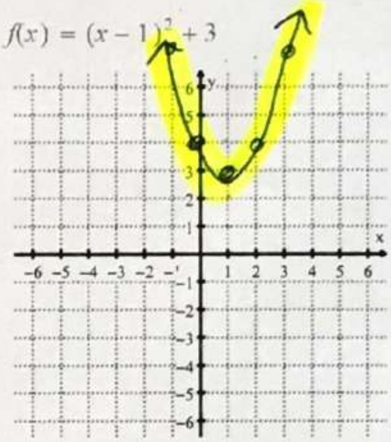
13. Graph $f(x) = x^2$

vertex (0,0)
a=1



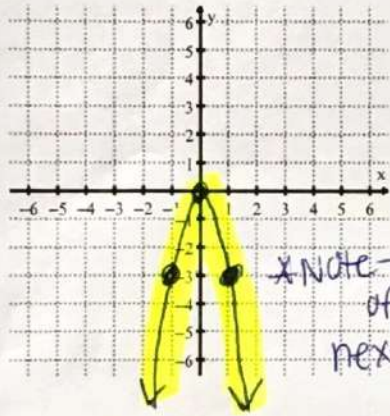
14. Graph $f(x) = (x-1)^2 + 3$

vertex: (1,3)
a = 1
stretch = 1



15. Graph $g(x) = -3x^2$

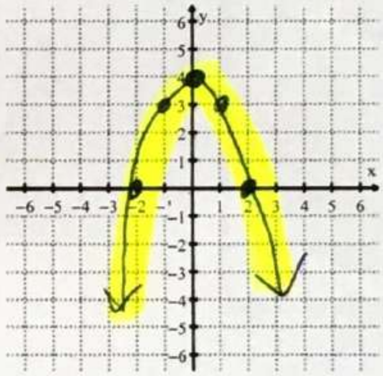
vertex (0,0)
a = -3
(stretch by 3)
also, ∩ b/c
negative



*Note – run out of space for next 2 points.

16. Graph $y = -x^2 + 4$

vertex: (0,4)
a = -1
negative
stretch
by 1



17. Write the equation of any parabola for which the axis of symmetry is $x = -3$.

(Hint: There are multiple solutions!)
Choose one that makes sense to you.

AOS = -3

so, the vertex is (-3, y) for any y!

ex). $y = (x+3)^2 + 2$ works.

$y = 2(x+3)^2 + 2$ does too!

ANY $y = a(x+3)^2 + k$ will do it!

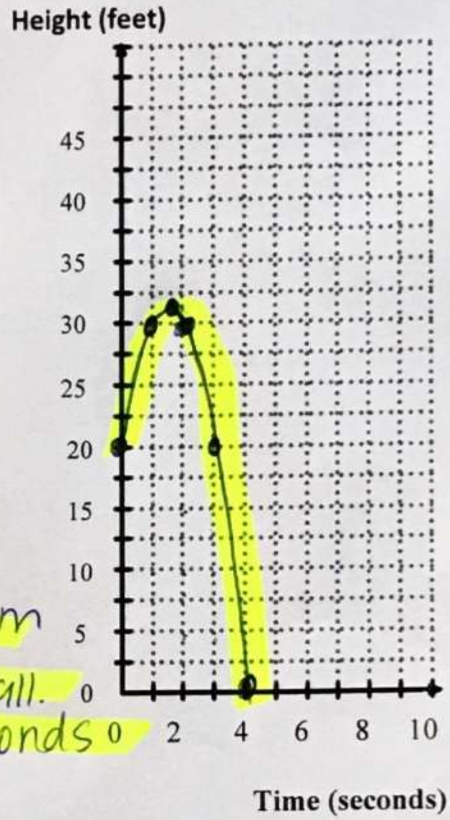
 Rev. 8/2016

Performance Task

19-24) Suppose you throw a ball up in the air with a velocity of 15 ft/s. The height $\boldsymbol{h}$ of the ball after $\boldsymbol{t}$ seconds in the air is given by the quadratic function $\boldsymbol{h}(\boldsymbol{t}) = -5\boldsymbol{t}^2 + 15\boldsymbol{t} + 20$.

19) Graph the function from the time the ball is thrown until it hits the ground.

t	$h(t)$
0	20
1	30
1.5	31.25
2	30
3	20
4	0



20) What is the vertex and explain its meaning within the context of the problem?

use $x = \frac{-b}{2a} = \frac{-15}{2(-5)} = \frac{-15}{-10} = \frac{3}{2} = 1.5$

$y = -5(1.5)^2 + 15(1.5) + 20$

$y = -5(2.25) + 22.5 + 20$

$y = -11.25 + 22.5 + 20 = 31.25$

vertex (1.5, 31.25) is the maximum height of the ball at time = 1.5 seconds

21) For what values of t is $h(t) = 30$? Explain the meaning of these values in context of the problem.

$t = 1$ and $t = 2$ is where $h(t) = 30$.
This means at 1second & 2seconds the ball's height was at 30ft.

22) For how many seconds is the ball in the air before it hits the ground?

The ball is in the air for 4 seconds. ($t=0$ to $t=4$).

23) In the context of height and time, what does the constant (+ 20) in the function $\boldsymbol{h}(\boldsymbol{t}) = -5\boldsymbol{t}^2 + 15\boldsymbol{t} + 20$.

It is the y-intercept, but more specifically, the height at which the ball is thrown from initially.

24) What is the domain and range in context of the problem?

Domain: (0, 4) Range: (0, 31.25).

Algebra 2 Practice Test (unit 2).

#1) $y = x^2 - 6x + 7$

vertex: $x = \frac{-b}{2a} = \frac{-(-6)}{2(1)} = \frac{6}{2} = 3.$

$y = (3)^2 - 6(3) + 7$
$y = 9 - 18 + 7$
$y = -2$

⇒ vertex $(3, -2)$ aka in Quadrant 4.
⇒ B.

#2). Solve $x^2 + 3x = 10$.
$\quad -10 \quad -10$

$x^2 + 3x - 10 = 0$. * Note: this <u>is</u> factorable.

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

so $x - 2 = 0$ or $x + 5 = 0$ by zero product property
$\quad +2 \; +2 \qquad -5 \; -5$

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

#3). Solve: $9x^2 - 10x - 5 = 0$.

* Not factorable. Use quadratic formula.

$a = 9 \quad b = -10 \quad c = -5$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(9)(-5)}}{2(9)}$$

$$= \frac{10 \pm \sqrt{100 + 180}}{18} = \frac{10 \pm \sqrt{280}}{18} = \frac{10 \pm \sqrt{4 \cdot 70}}{18}$$

$$= \frac{10 \pm 2\sqrt{7}}{18} = \boxed{\frac{5 \pm \sqrt{7}}{9}}$$

#4). a). $x = \frac{-3 \pm \sqrt{-2}}{8}$ ← Note the discriminant is negative!

This means we will have complex solutions! *AKA NO x-ints!

Also, $\pm$ is how we get 2 complex solutions.

⇒ B) Doesn't cross x-axis

⇒ D) 2 complex solutions.

#4) b) $x = \frac{-3 \pm \sqrt{2}}{8}$ ← Discriminant is positive! Therefore there are 2 Real solutions.

⇒ c) 2 Real solutions.

#4) c). What number would have to be under the radical so there is only 1 real solution?

⇒ c) zero.

$$\frac{-3 \pm \sqrt{0}}{8} = \frac{-3 \pm 0}{8} = \frac{-3 + 0}{8} = \frac{-3}{8}$$

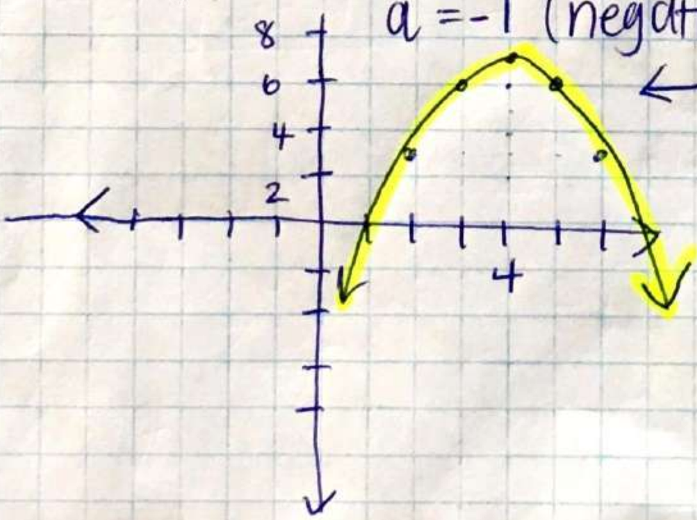
$$\frac{-3 - 0}{8} = \frac{-3}{8}$$

same #

#5). Graph. $f(x) = -(x-4)^2 + 7$

vertex form! vertex $(4,7)$.

$a = -1$ (negative 1 stretch factor).



← vertex is a maximum!

#6). Determine maximum/minimum for

$f(x) = -4x^2 + 16x + 2$

$a=-4 \quad b=16 \quad c=2$

Since $a=-4$, I know my parabola will have a negative vertical stretch and look like this  ← The vertex will be a maximum!

Next, where is the vertex?

$$x = \frac{-b}{2a} = \frac{-16}{2(-4)} = \frac{-16}{-8} = 2.$$

$$y = -4(2)^2 + 16(2) + 2$$

$$y = -4(4) + 32 + 2$$

$$y = -16 + 32 + 2$$

$$y = 18$$

⇒ vertex is at (2, 18).

Looking @ options, $f(x)=2$ is false b/c $f(x)=y$ and $y \neq 2$.

$f(x)=18$ is TRUE

⇒ C. maximum, $f(x)=18$.

#7). $(2-6i)-(-6+7i) = 2-6i+6-7i$

$= 8-13i$

#8). $(3-4i)^2 = (3-4i)(3-4i) = 9-12i-12i+16i^2$

$= 9-24i+16(-1)$

$= 9-24i-16$

$= \boxed{-7-24i}$

#9). $\frac{4}{5+2i}\left(\frac{5-2i}{5-2i}\right) = \frac{20-8i}{25-\cancel{10i}+\cancel{10i}-4i^2}$

$= \frac{20-8i}{25-4(-1)} = \frac{20-8i}{25+4} = \frac{20-8i}{29}$

#10 $y = x^2+6x+4$ in vertex form.

$a=1$ $b=6$ $c=4$

$y=a(x-h)^2+k$.

vertex is (h,k)

- Find vertex

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

$y=(-3)^2+6(-3)+4$

$y = 9-18+4$

$y=-9+4$

$y=-5$

vertex $(-3,-5)$

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

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

$a=1$ from earlier!

$\Rightarrow y=(x+3)^2-5.$

#12). vertex form:

$y=a(x-h)^2+k \Rightarrow y=1(x-2)^2+1 = (x-2)^2+1$

vertex $(2,1)$

stretch/$a=1$

Factored form:

Note zeros/x-intercepts @ $x=1$, $x=3$.

$a(x-r_1)(x-r_2) \Rightarrow a(x-1)(x-3) \Rightarrow (x-1)(x-3)$ since $a=1$.

Standard form: FOIL out factored: $x^2-3x-x+3$

$x^2-4x+3.$

Algebra 2 - Performance Task.

#19). Graph the function from the time the ball is thrown until it hits the ground.

$$h(t) = -5t^2 + 15t + 20.$$

t=	h(t) (work)	h(t) (answer)
0	$-5(0)^2 + 15(0) + 20$	$= 20.$
1	$-5(1)^2 + 15(1) + 20$	$= 30$
2	$-5(2)^2 + 15(2) + 20$	$= 30$
3	$-5(3)^2 + 15(3) + 20$	$= 20$
4	$-5(4)^2 + 15(4) + 20$	$= 0.$ ← Note: this is height = 0, so the ball has officially hit the ground. (aka we can stop).

see the graph on solutions page

#20). What's the vertex & explain it's meaning within the context of the problem.

$h(t) = -5t^2 + 15t + 20 \quad a = -5,\ b = 15,\ c = 20.$

use $x = \frac{-b}{2a} = \frac{-15}{2(-5)} = \frac{-15}{-10} = \frac{3}{2} = 1.5.$

$y = -5(1.5)^2 + 15(1.5) + 20$
$= 31.25$

⇒ vertex is at (1.5, 31.25). This means at time = 1.5 (seconds) the ball is at height 31.25 ft. Since this parabola is negative ($a = -5$), this parabola has a maximum at the vertex.

Thus, the vertex represents the balls maximum height at $t = 1.5$ seconds.

The rest are present on solutions page ☺