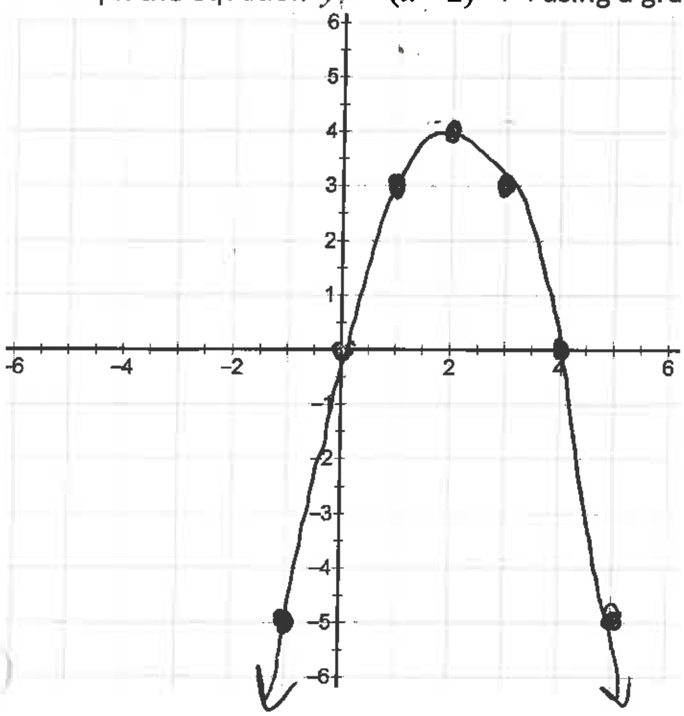
Algebra 1R – Mr. Bo
Unit 11 – Day 4 Notes

Name:______________________
Date:______________

Vertex Form & Transformations

Problem 1 – Vertex Form:

1. Graph the equation $y = -(x-2)^2 + 4$ using a graphing calculator.



a. What family of functions does this graph belong?

Quadratic.

b. What part of the equation would suggest that this graph opens down?

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

means opens down

c. What is the turning point?

(2, 4)

2. Carefully compare the turning point to the equation of the parabola. How are they related? Explain.

2 and 4 are part of the equation.
- subtracting the 2.
- Adding the 4:

3. $y = -(x-2)^2 + 4$ is called the **Vertex Form** of a quadratic function. This form is helpful in quickly identifying the vertex of the parabola.

For each quadratic written in vertex form, find the vertex. Determine if the parabola opens up or down.

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

Turning pt: (-3, -1)

opens up

b. $y = -2(x-5)^2 - 4$

Turning pt: (5, -4)

opens down

c. $y = 3(x+1)^2$

turning pt (-1, 0)

opens up.

GCF = -1

4. Find the vertex of each quadratic given in standard form and rewrite the equation in vertex form.

a. $y = -x^2 - 2x + 15$

turning pt: (-1, 16)

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

b. $y = 2x^2 - 20x + 48$

Turning pt: (5, -2)

GCF: 2.

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

5. Write a quadratic equation in vertex form based on the given information.

a. Vertex (3, -1); opens up

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

and pos. number

b. Vertex (-4, 5); opens down

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

any neg. #.

Problem 2 – Comparison of Forms:

	$y = ax^2 + bx + c$	$y = a(x - r_1)(x - r_2)$	$y = a(x - v_x)^2 + v_y$
Form Name	Standard.	Factored.	Vertex.
Opens up/down	a>0 up a<0 down.	a>0 up. a<0 down.	a>0 up a<0 down.
y-intercept	c.	not seen.	not seen.
x-intercepts	not seen.	$(r_1, 0)$ $(r_2, 0)$.	not seen.
Zeros	not seen.	$x = r_1$ $x = r_2$	not seen.
Vertex	not seen.	not seen.	(v_x, v_y)
Axis of symmetry	not seen.	not seen.	$x = v_x$

Problem 3 – Transformations:

1. Describe the transformation of the graph of f(x).

Transformation	Description	Example	Description
f(x)+a	Shift up a	$f(x)=x^2$ $g(x)=x^2+4$	g(x) is f(x) moved up 4.
f(x)-a	Shift down a	$f(x)=x^2$ $g(x)=x^2-4$	g(x) is f(x) moved down 4.
f(x+a)	Shift left a	$f(x)=x^2$ $g(x)=(x+4)^2$	g(x) is f(x) moved left.
f(x-a)	Shift Right a.	$f(x)=x^2$ $g(x)=(x-4)^2$	g(x) is f(x) moved Right.
-f(x)	Reflect over x-axis	$f(x)=x^2$ $g(x)=-x^2$	g(x) is f(x) Reflected over x-axis.
f(-x)	reflect over y-axis	$f(x)=x^2$ $g(x)=(-x)^2$	g(x) is f(x) Reflected over y-axis
a·f(x) 1 < a	Stretch vertical by factor of a ↕	$f(x)=\boxed{x^2}$ $g(x)=4\boxed{x^2}$	g(x) is f(x) Stretched vertical by factor of 4.
a·f(x) 0 < a < 1	Stretch horizontal by a factor of a. ↔	$f(x)=x^2$ $g(x)=\frac{1}{4}x^2$	g(x) is f(x) Stretched Horizontally by a factor of 4.

2. Describe the transformation performed on each function g(x) to produce p(x).

a. $g(x)=4x^2$
$p(x)=4x^2+7$

p(x) is g(x) moved up 7.

b. $g(x)=x^2+5$
$p(x)=(-x)^2+5$

p(x) is g(x) reflected over the y-axis.

c. $g(x)=x^2+3$
$p(x)=(x-1)^2+3$

p(x) is g(x) moved Right 1.

d. $g(x)=(x-5)^2$
$p(x)=-\frac{1}{2}(x-5)^2$

p(x) is g(x) reflected over x-axis and Stretched horizontal by a factor of $\frac{1}{2}$.