TRANSFORMATIONS

AGENDA

Warm-Up

HW Check

Notes p.106 & 107

HW: Practice #1-12

REMINDERS

Quiz tomorrow!

HW 5.4 & signed PR due tomorrow!

EOC Simulation Tuesday 3/31

WARM-UP THURSDAY

1. The line y=x is transformed to y= -4x - 1. Which of the following statements does not describe this transformation? Hint...use your calculator to graph both lines!

a) The slope is steeper.

b) The graph shifts down 1 unit.

c) The new graph goes through the origin.

d) The line is reflected.
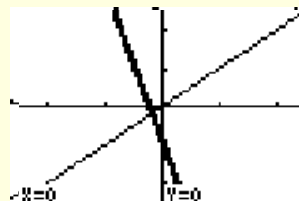
#9

#6, #10

QUESTIONS, COMMENTS, CONCERNS???

Algebra I - Unit 9: Topic 1 – Introduction to Quadratic Functions Day 3

Practice – Introduction to Quadratic Functions Day 3   **pp 590-605**

Name _____ Date _____ Period _____

Tell whether each function is linear, quadratic, or neither.

1. $-3x^2 + x = y - 11$

2.
x	-2	-1	0	1	2
y	-4	0	4	8	12

3. $\{(-10, 15), (-9, 17), (-8, 19), (-7, 21), (-6, 23)\}$

4. $y = -3x + 20$

5.
x	y
-4	8
-2	2
0	0
2	2
4	8

6. A function is described by the equation $f(x) = x^2 - 3$. The replacement set for the independent variable is
    {-4, -1, 2, 4}. Which of the following is contained in the corresponding set for the dependent variable?
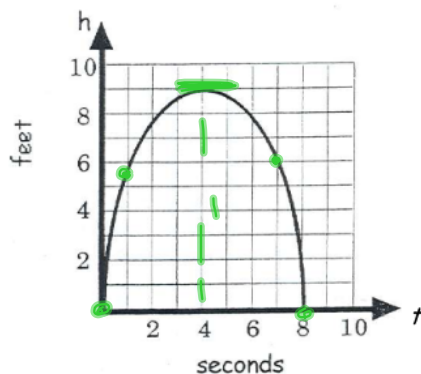
    A   6
    B   2
    C   -1
    D   13

    $\{13, -2, 1, 13\}$ Y

7. Given the function $f(x) = 3x^2 - 5$, what is the value of $f(-2)$?

8. A quadratic function is given below. What is $f(4)$?
    $f(x) = -x^2 + 3x - 2$

Algebra I - Unit 9: Topic 1 – Introduction to Quadratic Functions Day 3

9. Mark punted a football. The graph below represents the height, h of the football at time, t.

seconds

A. Find $f(1)$. _____ $x=1$ ≈ 5.5

B. Find $f(7)$. _____ $x=7$ 6

C. After how many seconds was the ball at its maximum height? _____ 4 sec

D. What was the maximum height of the ball? 9 ft

E. Fill in the table with four points that lie on the graph.

x	0	4	7	8
y	0	9	6	0

F. Calculate the quadratic equation. _____
(Round each part of the equation to the nearest tenth.)   1 decimal

10. Calculate the curve of best fit represented by the data in the table below.
(Round each part of the equation to the nearest tenth.)

5: Quad Reg

x	y
-8	-370
-3	-66
-1	-18
4	79
6	-175

QuadReg
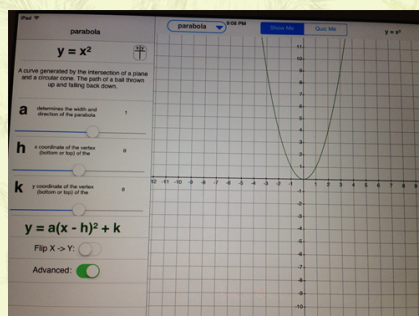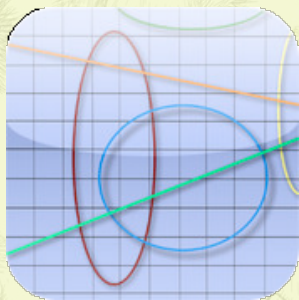$y=ax^2+bx+c$
$a=-5.330586731$
$b=8.823554482$
$c=27.86020742$

$y = -5.3x^2 + 8.8x + 27.9$

TRANSFORMATIONS
"MATHGRAPH" APP

On the Challenge Box:
Using the iPad app (in landscape mode) set on "parabola" and "advanced", drag the sliders for "a" and "k" (leave "h" as zero). What happens to the quadratic function as "a" gets bigger or smaller? What happens if you change "k"? Write down your observations on the challenge box of your warm-up page.

TRANSFORMATIONS FOLDABLE (PAGE 106)

Fold along this line

Cut along these lines

$y = ax^2$ $y = ax^2$ $a < 0$ $y = x^2 + c$

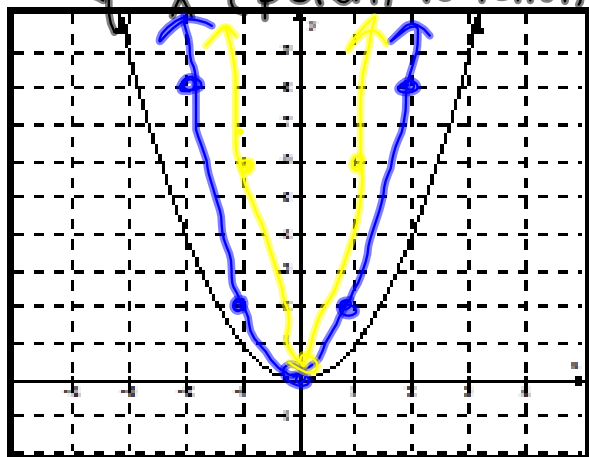**Summary: Effects of "a"**   **Summary: Effects of "c"**

1st Flap

$$y=ax^2$$

1st Flap

$f(x) = 2x^2$

$g(x) = 6x^2$

$y = x^2$ (parent function)

1st Flap

x	f(x) y	g(x) y
-2	8	24
-1	2	6
0	0	0
1	2	6
2	8	24

Verbal:
f(x) is more narrow (skinnier)

g(x) is even more narrow
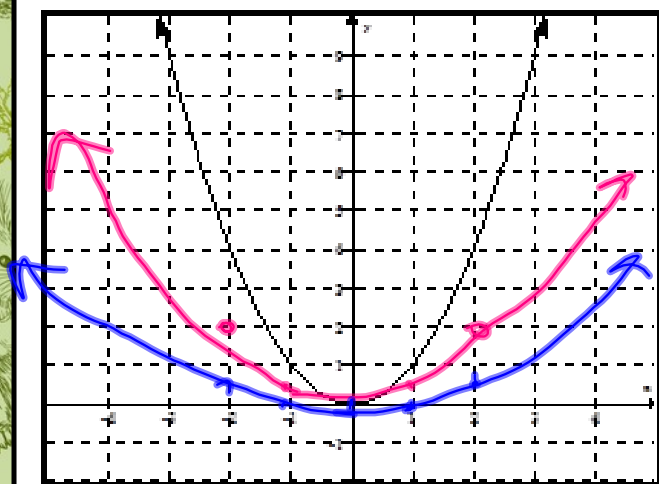
Domain: $\mathbb{R}$ $\mathbb{R}$ Range: $y \geq 0$ $y \geq 0$

$f(x) = \dfrac{1}{2}x^2$

$g(x) = 0.2x^2$

x	f(x) y	g(x) y
-2	2	.8
-1	1/2	.2
0	0	0
1	1/2	.2
2	2	.8

"FAT FRACTION"

Verbal:
f(x) got wider (fatter)

g(x) even wider

Domain: $\mathbb{R}$ $\mathbb{R}$ Range: $y \geq 0$ $y \geq 0$

2nd Flap

$$y = ax^2$$

$$a < 0$$

$$f(x) = -x^2$$
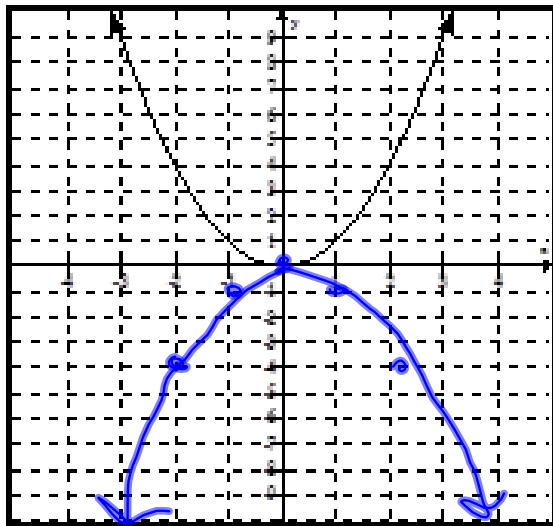
2nd Flap

x	y
-2	−4
-1	−1
0	0
1	−1
2	−4

Verbal:

Reflects (flips) across x-axis

Domain: ℝ

Range: y ≤ 0

3rd Flap

$$y = x^2 + c$$

3rd Flap

$$f(x) = x^2 + 6$$
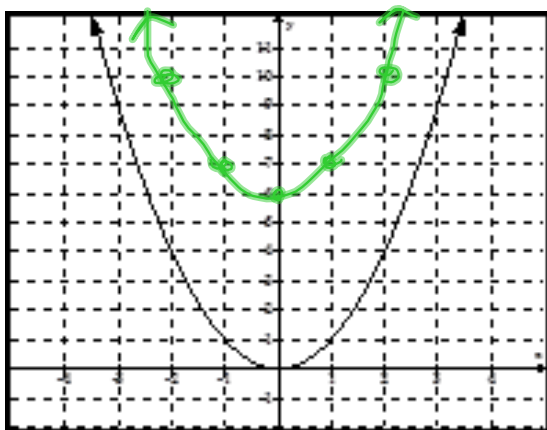
x	y
-2	10
-1	7
0	6
1	7
2	10

c = climb!

Verbal:

translated, moved, slides, shifts UP 6 units

Domain: $\mathbb{R}$ Range: $y \geq 6$

$$f(x) = x^2 - 3$$

x	y
-2	1
-1	-2
0	-3
1	-2
2	1

Verbal:

translated down 3 units

Domain: $\mathbb{R}$ Range: $y \geq -3$

TRANSFORMATIONS
SUMMARIES

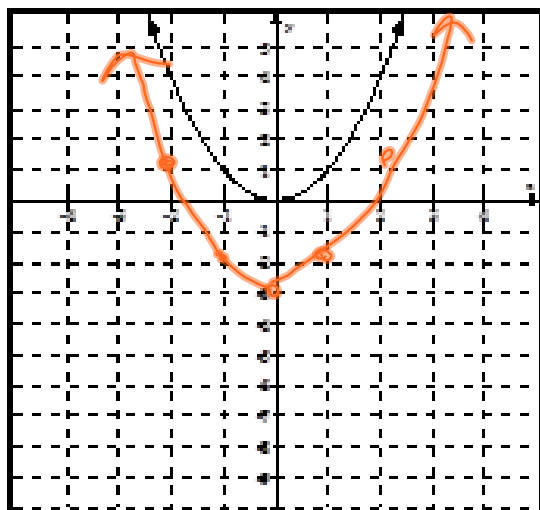At the bottom of your foldable, write a summary of what changing the coefficient or constant does to the graph of the quadratic function. Think about what happens if "a" is a fraction, a whole number, or negative.

Summary: Effects of "a"

Big (whole) # → narrow

small (fraction)# → wide

"FAT FRACTIONS"

a negative → flips

Summary: Effects of "c"

positive (+) → shifted UP

negative (-) → shifted DOWN

TRANSFORMATIONS P. 107

1. If the graph of the equation $y = \frac{3}{4}x^2 + 3$ is translated 3 units up, what will be the equation of the new graph?   **+3**

   $$y = \frac{3}{4}x^2 + 3 + 3$$

   $$\boxed{y = \frac{3}{4}x^2 + 6}$$

2. How does the graph of $y = \frac{1}{2}x^2 - 5$ compare with the graph of $y = \frac{1}{2}x^2 + 4$?
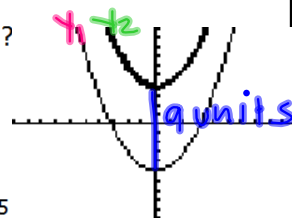
   A   The graph of $y = \frac{1}{2}x^2 - 5$ is 1 unit above the graph of $y = \frac{1}{2}x^2 + 4$.

   Ⓑ   The graph of $y = \frac{1}{2}x^2 - 5$ is 9 units below the graph of $y = \frac{1}{2}x^2 + 4$.   **9 units**

   ~~C~~   The graph of $y = \frac{1}{2}x^2 + 4$ is 1 unit to the left of the graph of $y = \frac{1}{2}x^2 - 5$

   ~~D~~   The graph of $y = \frac{1}{2}x^2 + 4$ is 9 units to the right of the graph of $y = \frac{1}{2}x^2 - 5$.

   only moves UP or DOWN

3. Write the following functions correctly in order from narrowest to widest graph.
   IGNORE NEGATIVES!   **Big   small**

   $$y = -\frac{5}{3}x^2, \quad y = 3x^2, \quad y = \frac{1}{7}x^2, \quad y = 7x^2$$

   greatest to least

   $$y = 7x^2, \quad y = 3x^2, \quad y = -\frac{5}{3}x^2, \quad y = \frac{1}{7}x^2$$

4. Wendi graphed a function of the form $y = ax^2 + c$. She then translated the graph 7 units up, resulting in the function $y = -\frac{2}{5}x^2 + 4$. Write the equation of Wendi's original function.   **+**

   $$y = -\frac{2}{5}x^2 - 3$$

HW #1-12, WILL BE SPOT CHECKED FOR ACCURACY! DON'T FORGET THE LAST PAGE...

Algebra I - Unit 9: Topic 2 – Transformations of Quadratics

Practice – Transformations of Quadratics   **pp 613-616**

Name _____ Date _____ Period _____

1. Which of these are characteristics of the parent function of a quadratic equation?
   - I. The parent function of a quadratic equation has the vertex at (0, 0).
   - II. The parent function of a quadratic equation opens downward.
   - III. The parent function of a quadratic equation has the y-axis as its line of symmetry.

   A I and II only
   B I and III only
   C II and III only
   D I, II, and III

2. If the graph of the equation $f(x) = x^2 - 2$ is translated 5 units down, what will be the equation of the new graph?

   A $f(x) = (x-5)^2 - 2$

   B $f(x) = x^2 - 7$

   C $f(x) = x^2 + 3$

   D $f(x) = -5x^2 - 2$

3. Toni drew the graph of $y = x^2$ on a coordinate plane. She then vertically stretched $y = x^2$ by a scale factor of 3. Which of these ordered pairs will Toni's second graph pass through?

   A (-1, 2)
   B (2, 9)
   C (3, 15)
   D (4, 48)

4. What is the effect on the graph of the equation $y = -4x^2$ when the equation is changed to $y = 4x^2$?

   A The graph of $y = 4x^2$ is translated 8 units down.
   B The graph of $y = 4x^2$ is a reflection of $y = -4x^2$ across the x-axis.
   C The graph of $y = 4x^2$ is translated 8 units up.
   D The graph of $y = 4x^2$ is a reflection of $y = -4x^2$ across the y-axis.

5. The graph of $y = 15x^2 + c$ is a parabola with a vertex at the origin. Which of the following is true about the value of c?

   A $c > 0$
   B $c < 0$
   C $c = 0$
   D $c = 15$

6. Which equation will produce the widest parabola when graphed?

   A $y = 4x^2$
   B $y = -9x^2$
   C $y = -0.9x^2$
   D $y = 0.4x^2$

7. Which of the following describes the translation of the graph of the equation $y = x^2 - 1$ to the graph of the equation $y = 2x^2 + 1$?

   A The graph is wider and shifted 1 unit up.
   B The graph is narrower and shifted 1 unit up.
   C The graph is wider and shifted 2 units up.
   D The graph is narrower and shifted 2 units up.

Algebra I - Unit 9: Topic 2 – Transformations of Quadratics

8. Which statement describes what happens to the graph of $y = ax^2$ when the value of a is changed from 1 to 6?

   A   The graph translates 6 units up.
   B   The graph translated 6 units to the right.
   C   The graph narrows.
   D   The graph widens.

9. How does the graph of $f(x) = x^2$ differ from the graph of $g(x) = x^2 + 5$?

   A   The graph of $g(x)$ is wider than the graph of $f(x)$.
   B   The graph of $g(x)$ is shifted down from the graph of $f(x)$.
   C   The graph of $g(x)$ is shifted up from the graph of $f(x)$.
   D   The graph of $g(x)$ is narrower than the graph of $f(x)$.

10. Which shows the functions correctly listed in order from widest to narrowest graph?

   A $y = -5x^2, y = -\frac{1}{5}x^2, y = \frac{2}{3}x^2, y = 7x^2$
   B $y = -\frac{1}{5}x^2, y = \frac{2}{3}x^2, y = -5x^2, y = 7x^2$
   C $y = \frac{2}{3}x^2, y = -\frac{1}{5}x^2, y = 7x^2, y = -5x^2$
   D $y = -5x^2, y = 7x^2, y = -\frac{1}{5}x^2, y = \frac{2}{3}x^2$

11. What is the effect on the graph of the equation $y = 3x^2 + 3$ when the equation is changed to $y = 0.3x^2 + 3$?

   A   The graph of $y = 0.3x^2 + 3$ is translated 3 units down.
   B   The graph of $y = 0.3x^2 + 3$ is narrower than the graph of $y = 3x^2 + 3$.
   C   The graph of $y = 0.3x^2 + 3$ is translated 3 units up.
   D   The graph of $y = 0.3x^2 + 3$ is wider than the graph of $y = 3x^2 + 3$.

12. The graph below represents $y = x^2 - 7$.
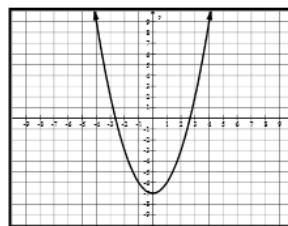
   A   If the graph of the function was translated 8 units up, what would be the equation of the new function?

   B   What would the domain and range be of the new function?

HW HELP: TRANSFORMATIONS

NO WORK = NO CREDIT = NO KIDDING!

This assignment will be spot checked for ACCURACY. Come to tutorials if you need to check your work! <u>Quiz TOMORROW</u>

1. The quadratic parent function is $y=x^2$. Check which statement is not true.

2. The graph will be shifted DOWN... subtract 5!

3. The new equation would be $y=3x^2$. Which point is on that graph?

4. What does making the equation negative do to the graph?

5. Try to plug in values for c to see which makes the parabola have a vertex at (0,0). A number more than 0 could be 4 and a number less than 0 could be -3.

6. The smaller the coefficient (ignoring the negative), the fatter the graph!

#7.

7. How are the 2 graphs different? $y=2x^2+1$ is the thick line!

8 - 9. Plug both equations into the calculator to check!

10. FAT FRACTIONS :) Ignore negatives!

11. Only the "a" value changes. Think about what effect that has on the graph...did it get bigger or smaller?

12. A. If you translate UP, then you ADD to the <u>original</u> equation. What is -7 + 8?

B. Domain of quadratic equations is always all real #s. The range depends on the concavity and the y-coordinate of the new vertex.