Name **Key** Date _____ Pd _____

Quadratic Calculator Tip Activity

<u>Goal:</u> The goal of this activity is to help you understand how your calculator can help you the most when solving or graphing quadratics.

<u>Directions:</u> Use your calculator to fill in the questions below to help get more familiar with the calculator and solving/graphing quadratics.

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y =

*You can use "y = " to help you with so many things dealing with quadratics.*

1. If you are graphing your quadratic, you can type it into y ='s in order to get a visual of your parabola.

   - You might need to adjust your window to see the parabola and we will this later.
   - Hit GRAPH to get the visual.
   - 2nd GRAPH to see all the points on your parabola.
   - WINDOW to adjust your window, especially if it is a word problem.
   - 2nd TRACE to find specific characteristics of the parabola. (discussed later)
   - ZOOM 6 will go back to your standard default -10 to 10 on both axes.
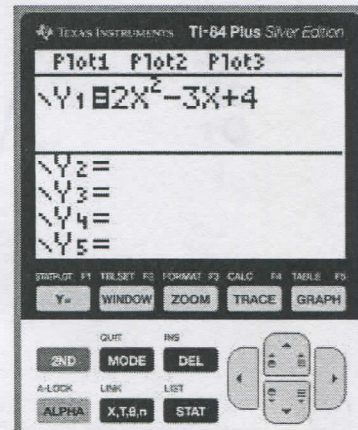
2. If you are factoring your quadratic, you can use y = to find all the factors of the product of your a-value and c-value. This should help you figure out which one will add to give you your b-value.

   - This is the X method. Top: product of a and c. Bottom: b-value sides are found on the table of your calculator.
   - Type into y = [(a)(c)]/x
   - Then hit 2nd GRAPH to see the table of values that make this equation true.
   - This is where you can find the correct side values that also multiply to give you the top of your X and the bottom b-value.
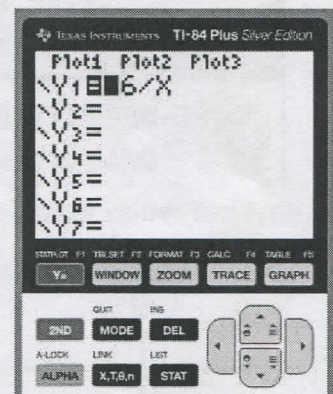
<u>PRACTICE</u>: Use the above two parts to help you factor to solve these two problems. Assume y = 0 when solving. Graph it using y = to check your answers from factoring to solve, use y = to help you fill out your X when factoring, adjust your zoom or window, and create a table of points that lie on your parabola from your calculator's table. Draw a sketch of your graph on here too.

1. $8x^2 + 21 = -59x + y$

$8x^2 + 21 + 59x = y$

a·c
8·21
168

56 ✕ 3
59
b

$y = \dfrac{168}{x}$

$(8x^2 + 56x) + (3x + 21) = y$

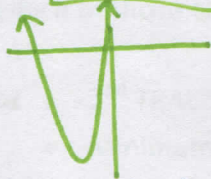$8x(x + 7) + 3(x + 7) = y$

$(8x + 3)(x + 7) = 0$

X	Y
56	3
84	2
42	4

$8x + 3 = 0$ $x + 7 = 0$

$8x = -3$ $\boxed{X = -7}$

$\boxed{X = -\dfrac{3}{8}}$

window
-10   -100
10   10
1   1

2. $6x^2 - 13x + 3 = y - 3$

$6x^2 - 13x + 6 = y$

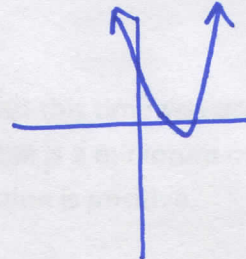$(6x^2 - 4x)(- 9x + 6) = y$

$2x(3x - 2) - 3(3x - 2) = y$

$(3x - 2)(2x - 3) = 0$

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

$3x = 2$ $2x = 3$

$\boxed{x = \dfrac{2}{3}}$ $\boxed{x = \dfrac{3}{2}}$

a·c
6·6
36

-4 ✕ -9
-13
b

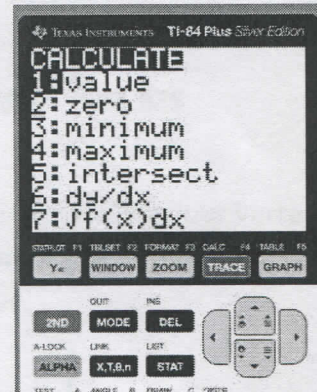| X	Y
-2	-18
-3	-12
-4	-9

window
-10   -10
10   10
1   1

2nd TRACE

This is used to find exact characteristics of your graph.

1. Once you have typed your equation into y =, you can use 2nd TRACE to find specific characteristics of your graph:
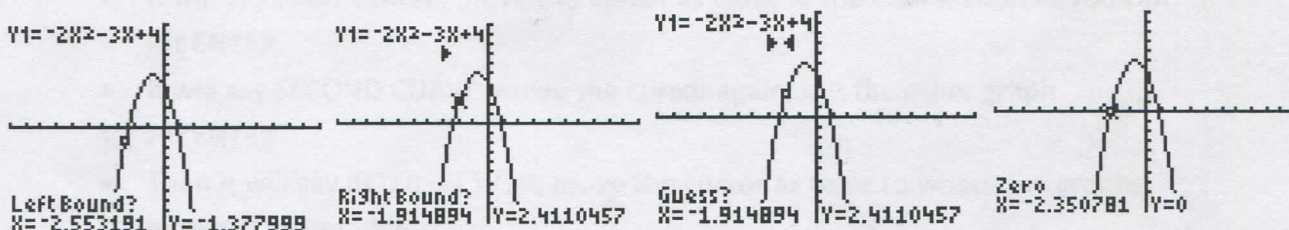
   - Value
   - Zero
   - Minimum
   - Maximum
   - Intersect

TEXAS INSTRUMENTS   TI-84 Plus Silver Edition

CALCULATE
1:value
2:zero
3:minimum
4:maximum
5:intersect
6:dy/dx
7:∫f(x)dx

2. <u>VALUE</u>: This helps you find a specific y-value when you have a specific x-value. You type in an x-value and hit enter. Your calculator will immediately give you the y-value and show you where it is on your parabola.

Y1=2X²-3X+4

X=-2   Y=18
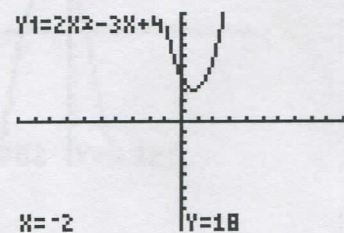
3. <u>ZERO</u>: This helps you find the zeros/roots/solutions/x-intercepts of your parabola. Sometimes there are none, one, or two possible zeros. Identify first which zero you are trying to figure out. Then you need to go left of the solution, hit ENTER, then move the cursor to the right of the solution (use the left and right arrows to move the cursor), hit ENTER, then move your cursor as close as possible to where you believe the solution is and hit ENTER for the last time. It should give you the coordinate for the root you were looking for.

Y1=-2X2-3X+4 Left Bound? X=-2.553191 Y=-1.377999
Y1=-2X2-3X+4 Right Bound? X=-1.914894 Y=2.4110457
Y1=-2X2-3X+4 Guess? X=-1.914894 Y=2.4110457
Zero X=-2.350781 Y=0

- <u>IF it gives you an ERROR MESSAGE, you probably did not go left and right of your root correctly.</u>

4. <u>Minimum:</u> This is similar to finding the zero, but this time you are finding your vertex coordinate. It is important to know if your vertex is a minimum or maximum to know which of those two options to select. Your a-value is positive.

- 2nd TRACE
- Minimum
- Left of your vertex, hit ENTER
- Right of vertex, hit ENTER
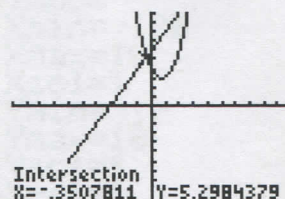- Guess where your vertex is, hit ENTER
- You should have the coordinate

Minimum X=.74999997 Y=2.875
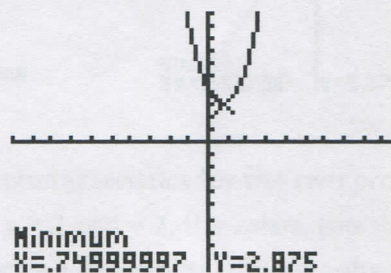
5. <u>Maximum:</u> This is similar to finding the zero, but this time you are finding your vertex coordinate. It is important to know if your vertex is a minimum or maximum to know which of those two options to select. You're a-value is negative.

- 2nd TRACE
- Minimum
- Left of your vertex, hit ENTER
- Right of vertex, hit ENTER
- Guess where your vertex is, hit ENTER
- You should have the coordinate

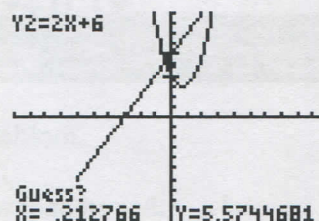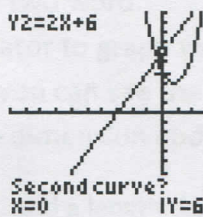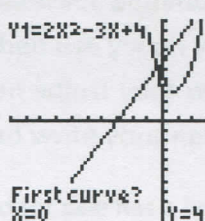Maximum X=-.7499982 Y=5.125
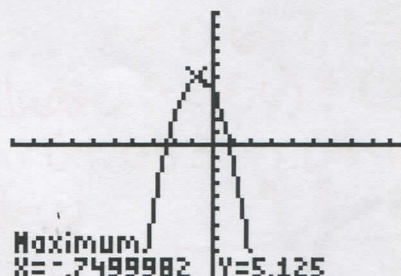
6. <u>Intersect:</u> This will help you find where two graphs intersect. So this is most useful with systems of equations or finding answers for real-world problems.

- Type both equations into y =
- Then hit 2nd TRACE
- Choose INT ERSECT
- It will say FIRST CURVE, move the cursor as close to the intersection as you can
- Hit ENTER
- It will say SECOND CURVE, move the cursor again, but the other graph
- Hit ENTER
- Then it will say INTERSECTION, move the cursor as close to where the graphs intersect as possible
- Hit ENTER
- It will then give you the coordinate for the point of intersection between the two graphs. Some graphs will have more than one point of intersection

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Plot1 Plot2 Plot3
\Y1☐2X²-3X+4
\Y2☐2X+6
\Y3=
\Y4=
\Y5=
\Y6=
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Y1=2X2-3X+4   First curve? X=0   Y=4

Y2=2X+6   Second curve? X=0   Y=6

Y2=2X+6   Guess? X=-.212766   Y=5.5744681

Intersection X=-.3507811   Y=5.2984379

PRACTICE: Use the above parts, 2 – 6, to help you find key characteristics for the two problems bel ow. Graph it u sing y = and then locate the value when x = 2 and – 2, the zeros, the minimum/maximum coordinate. Then graph both together and determine if the graphs intersect. If yes, provide the point(s) of intersection. Draw a sketch and label your key characteristics of your graph on here too.

(-0.21, 8.988)
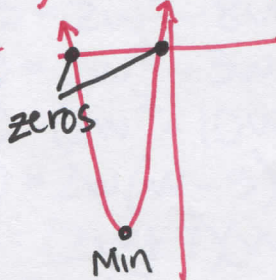
1. $8x^2 + 21 = -59x + y$

$y = 8x^2 + 59x + 21$

zeros: $x = -7, -0.375$
Evaluate: $(2, 171)$ & $(-2, -65)$
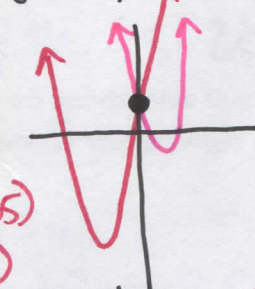Min: $(-3.6875, -87.78125)$

Window
-10   -100
10   10   zeros
1   1

Window
-10   -100
10   20
1   10
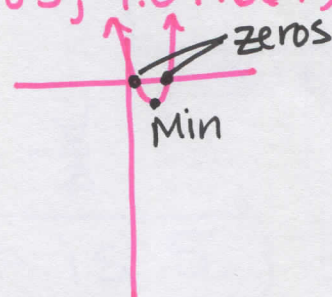
Min

2. $6x^2 - 13x + 3 = y - 3$

$y = 6x^2 - 13x + 6$

zeros: $x = 0.667, 1.5$
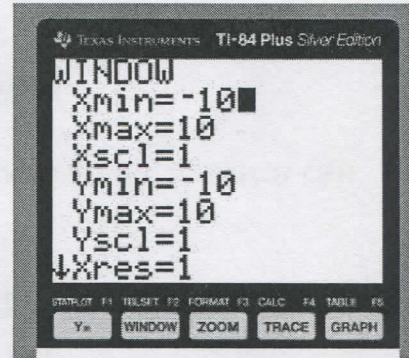Evaluate: $(-2, 56)$ & $(2, 4)$
Min: $(-1.083, -1.041667)$

Window
-10   -10
10   10
1   1

zeros

Min

WINDOW

This is where you can adjust how your graph looks to better answer questions.

1. The window defaults to -10 to 10 on both axes. There will be real-world problems that you might need to adjust the window to see the entire parabola or at least key parts of it.

2. If you or someone else has used your calculator and changed your window, you can reset it back to "normal" one of two ways.

   - You can reset your entire calculator by hitting: 2nd + 7 1 2
   - ZOOM 6: which is ZOOM STANDARD
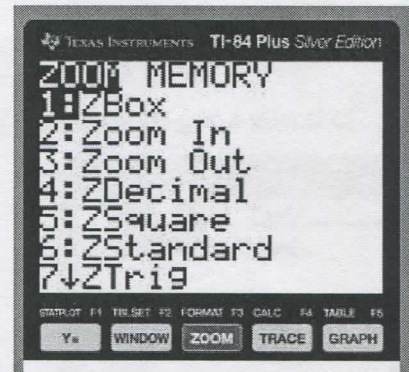
PRACTICE: Write quadratic equations for the two word problems below. Then use y = on your calculator to graph your two equations. Then adjust your window so you can see the entire quadratic and write your new window dimension under the problem.

1. A plot of land for sale has a width of x ft., and a length that is 8ft less than its width. A farmer will only purchase the land if it measures 240 square feet. What value of x will cause the farmer to purchase the land?

$$x(x-8) = 240$$
$$x^2 - 8x - 240 = 0$$
$$(x-20)(x+12) = 0$$
$$x - 20 = 0 \qquad x + 12 = 0$$
$$x = 20 \qquad x \neq -12$$

a·c
1· -240
-240
-20 ✕ 12
-8
b

$$\boxed{A = 240ft^2} \; x$$
$$x - 8$$

If the width is 20ft, then the farmer will buy.

2. The length of a rectangle is 5 inches more than twice a number. The width is 4 inches less than the same number. If the area of the rectangle is 15, find the number.

a·c
2· -35
-70
-10 ✕ 7
-3
b

$$A = lw$$
$$15 = (2w+5)(w-4)$$
$$15 = 2w^2 - 8w + 5w - 20$$
$$0 = 2w^2 - 3w - 35$$
$$0 = (2w^2 - 10w) + (7w - 35)$$
$$0 = 2w(w-5) + 7(w-5)$$
$$0 = (2w+7)(w-5)$$
$$2w + 7 = 0 \qquad w - 5 = 0$$

$$w = 5, -\cancel{\tfrac{7}{2}}$$

$$\boxed{w + 4 \quad A = 15u^2}$$
$$2w + 5$$

The # is 5.