From the Teacher: Mr. Haut

Class: Algebra 1

Periods: 5 and 6

Assignment: Week 2

If turning in paper packet and work, make sure to include this header information on all pages!

From the Student:
Student Name
Teacher Name
Name of class
Period #
Assignment #

Distance Learning 2020 Week 2 (April 27th-May 1st)

Assignments are accessible in Microsoft Teams on Office 365. Work can also be submitted in Teams, which I highly encourage you to do if you are able to. You can contact Mr. Haut if you need help with Teams. You must write your name in pen on each page of your assignment.

The work for week 2 is due on 5/8/2020.

My office hours are 1 pm – 3 pm, M–F. You can reach me through Remind (@haut-alg1), email (dhaut@tusd.net) or chat on Teams. Please continue to check your e-mail regularly.

Week 2

Graphing quadratic functions in Standard Form & Zeros of a function

Week 2: Day 1 (turn in by 5/8/2020):

Graphing Quadratic Functions in Standard Form

Read over notes on Graphing quadratic functions in standard form. Can also read the book, Explore in 20.1 on p.937.

Assignment #1 is Worksheet "Standard Form"

Other resources that can help are

Finding the axis of symmetry and the vertex

https://youtu.be/iKt6vjAygLc

https://youtu.be/5hQqj8EHNqo

Week 2: Day 2–3 (turn in by 5/8/2020):

Solve Quadratic equations graphically

Read over notes on Solving quadratic equations graphically. Can also read the book, Explain 1 in 20.1 on p.938-939.

Assignment #2 is pg.945 (3-10)

Other resources that can help are

https://youtu.be/reRSfNfmcsk (Sound isn't very loud, but good content)

Week 2: Day 4 (turn in by 5/8/2020):

Factored form of a quadratic equation

Read over notes on Factored form of a quadratic equation. Can also read the book, Explain 1 & 2 in 20.2 on p.952-953

Assignment #3 is pg.958 (5-14)

Other resources that can help are

Rewriting in standard form

https://youtu.be/uFBbdMh2k_E

https://youtu.be/gVracHjxQyM

Week 2: Day 5 (turn in by 5/8/2020):

Zero Product property

Read over notes on Zero Product Property. Can also read the book, Explore and Explain 1 in 20.3 on p.961-962.

Assignment #4 is p.966 (1-8)

Other resources that can help are

On Khan Academy

https://youtu.be/yCcMCPHFrVc

Graphing Quadratic Functions in Standard Form

Week 2: Day 1

Standard form of a Quadratic Equation

$y = ax^2 + bx + c$, where a, b, and c are real numbers and $a \neq 0$.

★ When graphing given standard form, will need vertex first like when given vertex form (last week)

⇒ Start with the axis of symmetry (the x-coordinate of the vertex!)

The axis of symmetry for a quadratic equation in standard form is given by the equation $x = \frac{-b}{2a}$

The vertex of a quadratic equation in standard form is

$\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right) \right)$

axis of symmetry formula

after finding the x-coordinate, plug that value into the equation to find the y-value (like we do with any other point)

Ex Give the axis of symmetry and the coordinates of the vertex of the quadratic equation

a $y = 2x^2 + 8x + 12$

a b

Axis of Symmetry ⇒ $x = \frac{-b}{2a}$

$a = 2$ $b = 8$

$x = \frac{-8}{2(2)} = \frac{-8}{4}$

$x = -2$ Axis of Symmetry

Vertex $(-2, ?)$ ← from axis of symmetry!

to find y, plug x (-2) into equation!

$y = 2(-2)^2 + 8(-2) + 12$

$y = 2(4) - 16 + 12$

$= 8 - 16 + 12$

$= -8 + 12$

$y = 4$

★ Vertex is $(-2, 4)$

b $y = x^2 - 12x - 2$

a b

$a = 1$ $b = -12$

Axis of Symmetry $x = \frac{-(-12)}{2(1)} = \frac{12}{2}$

$x = 6$

Vertex is $(6, ?)$

$y = (6)^2 - 12(6) - 2$

$= 36 - 72 - 2$

$= -36 - 2$

$y = -38$

★ Vertex is $(6, -38)$

c $y = -4x^2 + 12$

No b, so $= 0$!

$a = -4$ $b = 0$

Axis of Symmetry

$x = \frac{-0}{2(-4)} = \frac{0}{-8}$

$x = 0$

Vertex is $(0, ?)$

$y = -4(0)^2 + 12$

$= -4(0) + 12$

$= 0 + 12$

$y = 12$

★ Vertex is $(0, 12)$

How to Graph a Quadratic function in Standard form

1) Find the vertex (x-coordinate is $x = \frac{-b}{2a}$, then plug into equation to find y-coordinate)
2) Make a table of points with 2 points on either side of the vertex
3) Plot 5 points from table and draw parabola

Ex Graph the function

a $y = 2x^2 - 16x + 30$

Vertex: $a=2$ $b=-16$

$x = \frac{-(-16)}{2(2)} = \frac{16}{4} = 4$

$y = 2(4)^2 - 16(4) + 30$
$= 2(16) - 64 + 30$
$= 32 - 64 + 30$
$= -32 + 30$
$y = -2$

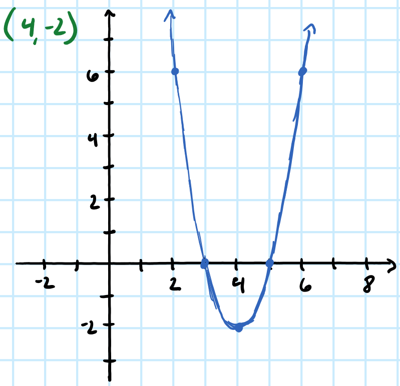
Vertex: $(4, -2)$

	x	y
	2	6
	3	0
Vertex →	4	-2
	5	0
	6	6

} found by symmetry (less to plug in!)

x=2
$y = 2(2)^2 - 16(2) + 30$
$2(4) - 32 + 30$
$8 - 32 + 30$
$-24 + 30$
$y = 6$

x = 3
$y = 2(3)^2 - 16(3) + 30$
$= 2(9) - 48 + 30$
$= 18 - 48 + 30$
$= -30 + 30$
$y = 0$



b $y = -x^2 - 4x$

Vertex: $a=-1$ $b=-4$

$x = \frac{-(-4)}{2(-1)} = \frac{4}{-2} = -2$

$y = -(-2)^2 - 4(-2)$
$= -(4) + 8$
$= -4 + 8$
$= 4$

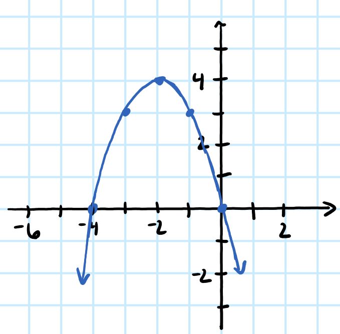
Vertex: $(-2, 4)$

	x	y
	-4	0
	-3	3
Vertex →	-2	4
	-1	3
	0	0

using symmetry again!

x=-1
$y = -(-1)^2 - 4(-1)$
$= -(1) + 4$
$= -1 + 4$
$= 3$

x= 0
$y = -(0)^2 - 4(0)$
$= -(0) - 0$
$= 0 - 0$
$= 0$



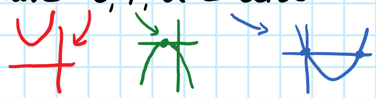
Solve Quadratic Equations Graphically

Week 2: Day 2-3

zero of a function - an x-value that makes the value of a function 0.

★ zeros of a function are the x-intercepts of the function's graph

A quadratic function can have 0, 1, or 2 zeros



Solving Quadratic Equations by Graphing

- rewrite equation so it is $=0$ (if necessary)
- replace 0 with y and graph the equation (look at previous notes, depending on form in!)
- Find the x-intercepts, which are the zeros of the function

★ since looking for when equation $=0$, these x-intercepts (zeros) are the solutions of the original equation

Ex Solve by graphing the related function

a. $3x^2+2=5$

$\quad -5 \quad -5$ ★ make $=0$

$3x^2-3=0$

$y=3x^2-3$ ★ make 0 into y & graph function

↑ standard form so find vertex using $x=\frac{-b}{2a}$

$a=3 \quad b=0$

$x=\frac{-0}{2(3)}=\frac{0}{6}=0$

$y=3(0)^2-3$

$=3(0)-3$

$=0-3$

$y=-3$ Vertex is $(0,-3)$

x	y
-2	9
-1	0
0	-3
1	0
2	9

$x=-2$

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

$=3(4)-3$

$=12-3$

$=9$

$x=2$ is the same by symmetry

$x=1$

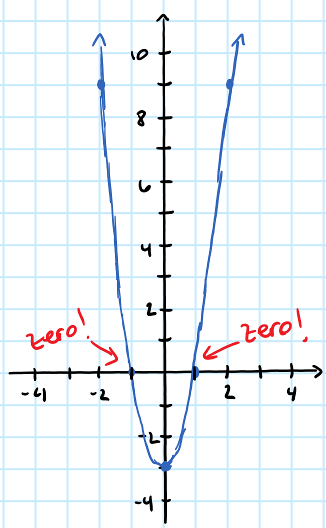
$y=3(1)^2-3$

$=3(1)-3$

$=3-3$

$y=0$

$x=-1$ is the same by symmetry



★ Since $x=-1$ and $x=1$ are the zeros (x-int) & the equation $=0$ they are the solutions!

$x=-1, 1$

b $6x + 8 = -x^2$

$+x^2 \qquad +x^2$

$x^2 + 6x + 8 = 0$

★ make $= 0$
and replace 0 with y

$y = x^2 + 6x + 8$ ★ in Standard form so use $x = \frac{-b}{2a}$ to find vertex

$\uparrow a \quad \uparrow b$

Vertex: $x = \frac{-6}{2(1)} = -\frac{6}{2} = -3$

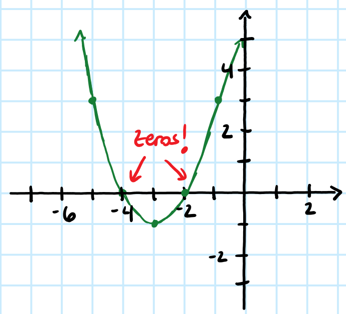
$y = (-3)^2 + 6(-3) + 8$
$= 9 - 18 + 8$
$= -9 + 8$
$y = -1$

Vertex: $(-3, -1)$

x	y
-5	3
-4	0
-3	-1
-2	0
-1	3

$x = -5$
$y = (-5)^2 + 6(-5) + 8$
$= 25 - 30 + 8$
$= -5 + 8$
$= 3$
★ also -1 by symmetry

$x = -4$
$y = (-4)^2 + 6(-4) + 8$
$= 16 - 24 + 8$
$= -8 + 8$
$= 0$
★ also $x = -2$ by symmetry



★ zeros (x-int) are at -2 and -4 and since looking for when the equation is $= 0$, they are the solutions!

$x = -2$ and $x = -4$

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

★ already $= 0$ so just replace 0 with y

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

h k

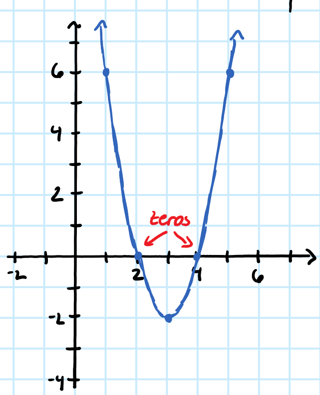
★ In Vertex form $y = a(x-h)^2 + k$, So Vertex is (h, k), no work to find it!!

Vertex: $(3, -2)$

x	y
1	6
2	0
3	-2
4	0
5	6

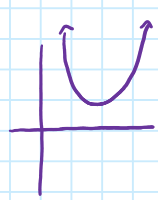
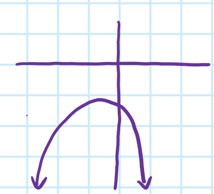
$x = 1$
$y = 2(1-3)^2 - 2$
$= 2(-2)^2 - 2$
$= 2(4) - 2$
$= 8 - 2$
$y = 6$
★ also have $x = 5$ by symmetry!

$x = 4$
$y = 2(4-3)^2 - 2$
$= 2(1)^2 - 2$
$= 2(1) - 2$
$= 2 - 2$
$y = 0$
★ also have $x = 2$ by symmetry!



★ zeros are at 2 and 4 Since looking for when equation is equal to 0 they are the solutions!!

$x = 2$ and $x = 4$

★ What happens if the graph looks like  or 

where there are no zeros?

⇒ Then there is No Solution!

★ Remember Quadratic equations can have 2, 1, or No Solutions!

Factored Form of a Quadratic Equation

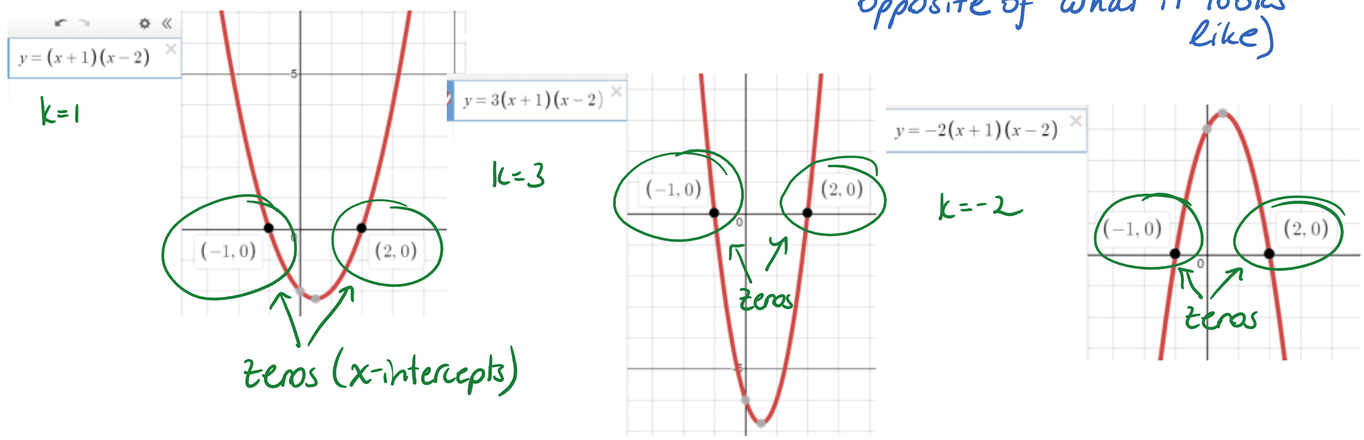
Week 2: Day 4

Factored form of a quadratic equation

$y = k(x-a)(x-b)$ where $k \neq 0$

☆ Let's look at the graph of $y = k(x+1)(x-2)$ for $k = 1, 3,$ and -2

⇒ so in this case $a = -1$ and $b = 2$ (they are like h in Vertex form opposite of what it looks like)



☆ Notice that the x-intercepts (zeros) are -1 and 2

(the a & b values, what are be subtracted from x in each ( )!)

k does not change the zeros, just stretches the graph or flips it over

So, the factors (the parentheses) in factored form give us the x-intercepts (zeros)

☆ in $y = k(x-a)(x-b)$ a & b are the x-intercepts (zeros) of the function!

Ex Write each function in standard form. Determine the x-intercepts & zeros of each function

a $y = 4(\underbrace{x-5}_{a})(\underbrace{x-1}_{b})$

☆ Let's find x-intercepts (zeros) first since easy in current form (factored form)

Since $a = 5$ and $b = 1$

The x-intercepts & zeros are $x = 5$ & $x = 1$

☆ To write in standard form, multiply 2 items then that answer with the remaining item

$y = 4(x-5)(x-1)$

	x	-5
x	x^2	$-5x$
-1	$-x$	5

$x^2 - 6x + 5$

$y = 4(x^2 - 6x + 5)$

$y = 4x^2 - 24x + 20$

b $y = -3(x+4)(x+3)$

x-intercepts & zeros are

$x = -4$ & $x = -3$

☆ Since $y = -3(x+4)(x+3)$

$x-(-4)$ $x-(-3)$

x-intercepts!

☆ Standard form

$y = -3(x+4)(x+3)$

$(x+4)(x+3)$

$x^2 + 3x + 4x + 12$

$= x^2 + 7x + 12$

$y = -3(x^2 + 7x + 12)$

$y = -3x^2 - 21x - 36$

Using Zero Product Property to Solve Equations

Week 2: Day 5

Zero Product Property

For all real numbers a and b, if the product of the two quantities equals zero, then at least one of the quantities equals zero

If $ab=0$, then $a=0$ or $b=0$

☆ The only way to get zero when multiplying is for 1 of the items being multiplied to be 0!

Ex Find the zeros of each function ☆ meaning find x values that make the function $=0$!

a $f(x)=(x-16)(x+21)$

☆ replace f(x) or y with 0 since looking for zeros!

$0=(x-16)(x+21)$

☆ Apply Zero Product Property (since 2 things multiplied to get 0!) meaning either $1^{st}(\,)=0$ or $2^{nd}(\,)=0$

$x-16=0$ or $x+21=0$

$+16\ \ +16 \qquad -21\ \ -21$ ☆ now solve new equations!

$x=16$ or $x=-21$

b $g(x)=-4(x-8)$ ☆ replace g(x) with 0

$0=-4(x-8)$

☆ apply Zero Product Property

$-4=0$ ← not relevant since no variable!

$x-8=0$

$+8\ \ +8$

$x=8$

c $h(x)=3x(x-12)$

$0=3x(x-12)$

$\frac{3x}{3}=\frac{0}{3}$ $\qquad x-12=0$

$+12\ \ +12$

$x=0$ or $x=12$

d $k(x)=\frac{1}{2}(x-2)(x+3)$

$0=\frac{1}{2}(x-2)(x+3)$

☆ only care about factors that have variable! (so ignore $\frac{1}{2}$)

$x-2=0 \qquad x+3=0$

$+2\ \ +2 \qquad -3\ \ -3$

$x=2$ or $x=-3$

Standard Form (Week 2 Assignment #1) **Algebra 1**

Give the axis of symmetry and the coordinates of the vertex of the quadratic function.

1. $y = 2x^2 + 4x + 6$
2. $y = -3x^2 + 6x - 2$
3. $y = -x^2 + 2x - 2$
4. $y = x^2 + 2x - 3$

Graph the function. State the domain and range.

5. $y = 2x^2 + 8x + 10$
6. $y = -x^2 + 2x + 1$
7. $y = -4x^2 + 32x - 62$
8. $y = 2x^2 + 12x + 19$