**From the Teacher: J. Backster**

**Class: Algebra 1**

**Periods: 3,4,5**

**Assignment: Week 1**

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 1

## Graphing quadratic functions in Vertex form & Converting to standard form

Assignments will be sent through Remind. Work will be submitted by taking a picture of the solutions to the assignment and then texting it to me through Remind. You must write your name in pen on each page of your assignment. Follow the labeling shown above.

The work in this packet is not officially due until 5/8/2020. However, I have broken down the work into daily chunks to help you manage your time. I encourage you to have the work from week 1 complete by 4/24/2020. New assignments for weeks 2 and 3 will be given that date.

My office hours are 10 am – 12 pm, M–F. You can reach me through texts on the Remind App.
Most of you are already signed up with me but if not then:
Text to the 5 digit phone number **81010** with
the message **@backster3** then **SEND** the message and reply with your name
period 4 code is **@backster4**
period 5 code is **@backster5**
If you need to email the pictures you will need to go to www.remind.com and enter the class code above and then enter your email address. Do not email the pictures directly to me on jbackster@tusd.net; that email is for communication that cannot happen through REMIND so my email is not clogged. If you do not have access to a phone, you will have to do the paper packets and turn them into the school on the **due dates of May 8** for packets 1 and 2 **and May 15** for packets 3 and 4. Please do your best to work it out so you do not need a paper packet. **Please submit your work digitally.**

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**Week 1: Day 1-2 (turn in by 5/8/2020):** Graphing Quadratic Functions in Vertex Form

Read over notes on Graphing quadratic functions in vertex form (first 3 pages of notes).

### Assignment #1

Other resources that can help are

On this site will need to scroll down to Graphing section
http://mathbitsnotebook.com/Algebra1/Quadratics/QDVertexForm.html

Vertex form video on Khan Academy
https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:quadratic-functions-equations/x2f8bb11595b61c86:vertex-form/v/vertex-form-intro

Graphing in Vertex form on Khan Academy
https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:quadratic-functions-equations/x2f8bb11595b61c86:vertex-form/v/graphing-a-parabola-in-vertex-form

*If turning in work on Teams (which I highly encourage you to do if you are able to), you can do your assignment on binder paper and then upload a picture of it. Please write your name in pen on each page before you take a picture. Make sure your picture is clear and your work is readable.

**Week 1: Day 3 (turn in by 5/8/2020):** Converting vertex form to standard form

Read over notes on Converting vertex form to standard form (last page of notes).

## Assignment #2

Other resources that can help are

On this site will need to scroll down to To convert from Vertex Form to…
http://mathbitsnotebook.com/Algebra1/Quadratics/QDVertexForm.html

https://youtu.be/UbhFIjI28Ts

Algeomulus Prep Academy (West high student made!)
https://youtu.be/M2Y1lSB1vaE

**Week 1: Day 4-5 (turn in by 5/8/2020):** More Practice

## Assignment #3

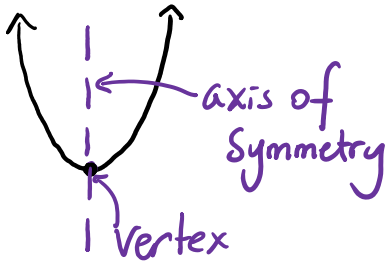
# Graphing Quadratic Functions in Vertex Form

## Vertex Form of a Quadratic function

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

Vertex: $(h, k)$

Axis of Symmetry: $x = h$




Remember

a - stretches (if $|a|>1$) or compresses (if $0<|a|<1$) the graph
reflects across the x-axis if $a<0$ (if a is negative)

h - shifts graph left (if $h<0$) or right (if $h>0$) h units
★ h is opposite of what it looks like
if $(x+3)^2$ then $h=-3$
if $(x-2)^2$ then $h=2$

k - shifts graph up (if $k>0$) or down (if $k<0$) k units

## How to graph a Quadratic function in Vertex form

1) Identify the vertex $(h, k)$
2) Make a table of points with 2 points on either side of the vertex
3) Plot 5 points from table and draw parabola

Examples Instructions:

For each quadratic function
→describe the transformations on the parent function $f(x)=x^2$
→Identify the vertex
→State if the vertex is a minimum or a maximum
→Identify the axis of symmetry
Then graph the function

## Example 1

$$g(x) = \underset{\downarrow}{2}(x+\underset{\downarrow}{1})^2+\underset{\downarrow}{3} \qquad a \;\; h \;\; k$$

★ To identify transformations use a, h, k

$a = 2$ Stretched vertically (★ Since $a=2$, so $a>1$)

$h = -1$ Shifted left 1 unit (left since h is negative)

$k = 3$ Shifted up 3 units (up since k is positive)

★ Vertex is $(h,k) \Rightarrow (-1,3)$

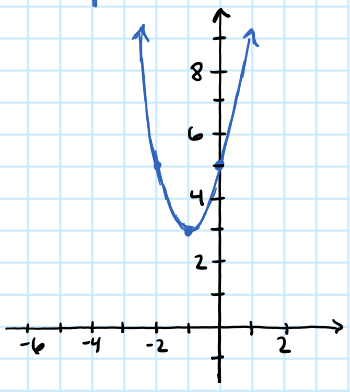
★ Since a is positive ($a=2$) graph opens up ↳ vertex

So, Vertex is a minimum (lowest point)

★ Axis of symmetry: $x = -1$ (★ $x = h$)

★ Graph

| | x | y |
|---|---|---|
| 2 #s less than −1 | −3 | 11 |
| | −2 | 5 |
| vertex → | −1 | 3 |
| 2 #s more than −1 | 0 | 5 |
| | 1 | 11 |




To find y values, plug each x-value into the function.

$x=-3$ $y = 2(-3+1)^2+3$
$= 2(-2)^2+3$
$= 2(4)+3$
$= 8+3$
$y = 11$

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

$x=0$ $y = 2(0+1)^2+3$
$2(1)^2+3$
$2(1)+3$
$2+3$
$y = 5$

$x=1$ $y = 2(1+1)^2+3$
$= 2(2)^2+3$
$= 2(4)+3$
$= 8+3$
$= 11$

★ 11 is a bit big so ok if don't graph it.

## Example 2

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

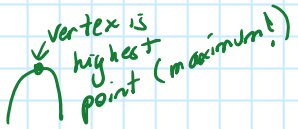
☆ Describe transformations

$a = -\frac{1}{2}$ → Compresses graph & reflected across the x-axis
↑ since $|a|<1$ $(\frac{1}{2}<1)$ ↑ since a is negative

$h = 1$, $k = -2$ → Graph is shifted right 1 unit and down 2 units
↑ since $h=+1$ ↑ since $k=-2$

Vertex is $(1, -2)$ ← $(h, k)$

The vertex is a maximum ← since opens down (a is negative)




☆ Graph

| x | y |
|---|---|
| -3 | -10 |
| -1 | -4 |
| 1 | -2 |
| 3 | -4 |
| 5 | -10 |

vertex →

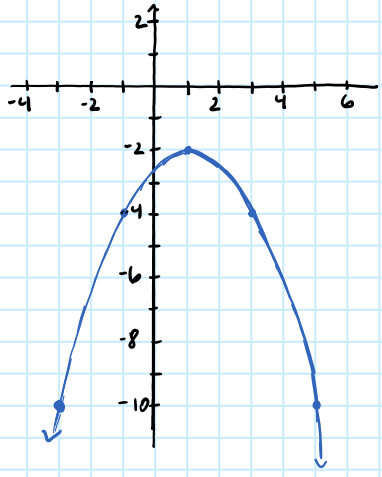
☆ added & subtracted 2 to get other x-values for table since am avoiding fractions and a has a denominator of 2

$x=-3$ $y = -\frac{1}{2}(-3-1)^2 - 2$
$= -\frac{1}{2}(-4)^2 - 2$
$= -\frac{1}{2}(16) - 2$
$= -8 - 2$
$y = -10$

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

$x=3$ $y = -\frac{1}{2}(3-1)^2 - 2$
$= -\frac{1}{2}(2)^2 - 2$
$= -\frac{1}{2}(4) - 2$
$= -2 - 2$
$y = -4$

$x=5$ $y = -\frac{1}{2}(5-1)^2 - 2$
$= -\frac{1}{2}(4)^2 - 2$
$= -\frac{1}{2}(16) - 2$
$= -8 - 2$
$y = -10$



# Converting Vertex form to Standard Form

## Standard Form of a Quadratic Function

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

could be in function notation $f(x) = \ldots$

otherwise no $x^2$ term and not a quadratic any more

☆ Any quadratic function in Vertex form can be changed/rewritten in standard form.

→ to change vertex form to standard form multiply it out

1) deal with squaring ( )
2) then multiply a through ( )
3) combine like terms

**Examples** Instructions:

Rewrite the quadratic function from vertex form to standard form

a) $y = 2(x-7)^2 + 4$

square first!!

$= 2(x^2 - 14x + 49) + 4$

$= 2x^2 - 28x + 98 + 4$

$y = 2x^2 - 28x + 102$

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

☆ use box or foil to multiply

| | $x$ | $-7$ |
|---|---|---|
| $x$ | $x^2$ | $-7x$ |
| $-7$ | $-7x$ | $49$ |

$= x^2 - 14x + 49$

replace in ← equation

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

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

$= -3x^2 - 12x - 12 - 1$

$y = -3x^2 - 12x - 13$

$(x+2)^2 = (x+2)(x+2)$

$x^2 + 2x + 2x + 4$

$x^2 + 4x + 4$

**Week 1, Assignment 1** **Algebra 1**

For #1-9 do the following.

a. Graph the function.
b. State the domain & range.
c. Identify the vertex.
d. Identify the axis of symmetry.
e. State if it has a maximum or minimum value and state that value.

**1.** $y = -\frac{1}{2}x^2$ **2.** $f(x) = -2(x+1)^2 + 2$ **3.** $y = -3x^2 + 4$

**4.** $y = (x+2)^2 - 5$ **5.** $g(x) = \frac{1}{2}(x-2)^2 - 3$ **6.** $k(x) = 2(x+3)^2$

**7.** $f(x) = (x-4)^2 - 1$ **8.** $y = 3x^2$ **9.** $f(x) = -(x-1)^2 + 2$

Describe the transformations performed on the graph of $f(x) = x^2$ to obtain $g(x)$.

**10.** $g(x) = -2(x-15)^2 + 92$ **11.** $g(x) = \frac{1}{7}(x+31)^2$

Multiply.

**12.** $(r-2)(6r+2)$ **13.** $(8x-2y)(-6x-2y)$ **14.** $(x-8)^2$

**Week 1, Assignment 2** **Algebra 1**

For #1-4 do the following.

f. Graph the function.
g. State the domain & range.
h. Identify the vertex.
i. Identify the axis of symmetry.
j. State if it has a maximum or minimum value and state that value.

**1.** $f(x) = -2(x+1)^2 + 2$

**2.** $y = -3x^2 + 4$

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

**4.** $f(x) = \frac{1}{2}(x-2)^2 - 3$

Rewrite the function into standard form.

**5.** $g(x) = -2(x-5)^2 + 9$

**6.** $g(x) = (x-9)^2 - 14$

**7.** $y = \frac{1}{2}(x-2)^2 + 11$

**8.** $y = 2(x+3)^2 - 6$

**9.** $y = -3(x-5)^2 + 4$

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

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**Week 1, Assignment 3** **Algebra 1**

Graph the function. State the domain and range.

1. $f(x) = (x-1)^2 + 2$
2. $g(x) = -\frac{1}{2}(x-2)^2 + 4$
3. $g(x) = -3(x-2)^2 + 6$
4. $h(x) = 2(x+1)^2 - 3$

Rewrite each quadratic function from vertex form, $y = a(x-h)^2 + k$, to standard form, $y = ax^2 + bx + c$.

5. $y = -4(x+1)^2 + 3$
6. $y = -(x-1)^2 + 3$
7. $y = \frac{1}{2}(x-4)^2 + 4$
8. $y = 4(x+1)^2 - 3$
9. $y = 2(x+3)^2 + 1$
10. $y = 3(x+2)^2 - 3$

Multiply.

11. $(2x-3)(x+2)$
12. $(3x+3)(5x-3)$
13. $(r-2)(6r+2)$
14. $(8x-2y)(-6x-2y)$