First correct the 2 homework graphing questions from the worksheet:

ii) Sketch the 2 functions below. $y = a(x-h)^2 + k$ V(h,k)

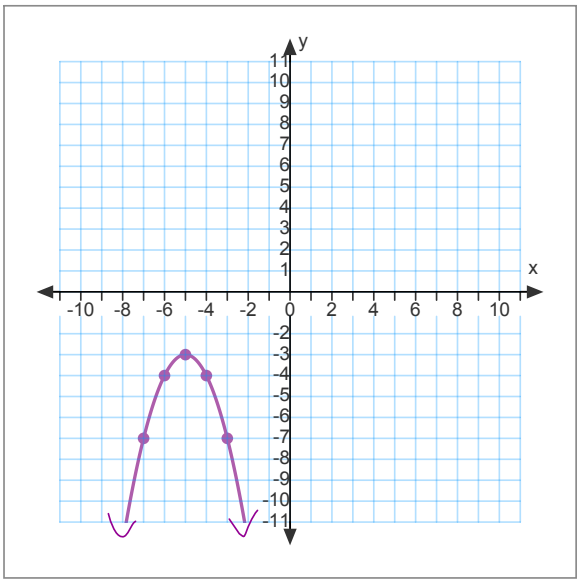
1. $a(x) = -(x+5)^2 - 3$ vertex (-5, -3)

MG

over	ups	
1	1	-1
2	4	-4
3	9	-9

a = -1

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



Domain: $\{x \in \mathbb{R}\}$

Range: $\{y \in \mathbb{R} \mid y \leq -3\}$

Test $a(-3) = -(-3+5)^2 - 3$

$= -(2)^2 - 3$

$= -(4) - 3$

$= -4 - 3$

$= -7$

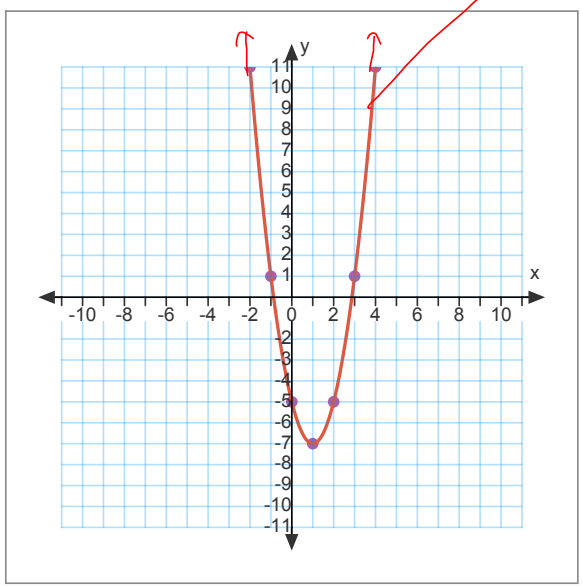
2. $b(x) = 2(x-1)^2 - 7$ vertex (1, -7)

MG

over	ups	
1	1	2
2	4	8
3	9	18

a = 2

$y = 2(x-1)^2 - 7$



Domain: $\{x \in \mathbb{R}\}$

Range: $\{y \in \mathbb{R} \mid y \geq -7\}$

$b(3) = 2((3)-1)^2 - 7$

$= 2(2)^2 - 7$

$= 2(4) - 7$

$= 8 - 7$

$= 1$

Today's Learning Goal(s):

By the end of the class, I will be able to:

a) Identify the "order of the moves" when graphing using transformations.
b) State the domain and range for "multiple move" transformations.

1.6 Graphing Quadratic Functions Using Multiple Transformations

(Quadratic Transformation Summary)

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

When you use transformations to graph $y = a(x-h)^2 + k$ apply the transformations like this:

Method:

Plot the vertex first.

Modify the "mother graph" (y) values by multiplying the "up" number by "a"

When "a" is a fraction, only use the exact multiples.

i.e. If $\frac{1}{3}$, then don't use over 1 OR 2, but use 3 and 6 to get:

From vertex: over 3 up 3, over 6 up 12

Ex.1: Given: $f(x) = -\frac{1}{3}(x+2)^2 + 6$

a) Describe the transformations, using appropriate mathematical language.

b) Graph the function.

$$y = -\frac{1}{3}(x+2)^2 + 6$$

V(-2, 6)

$y = x^2$

reflection in the x-axis

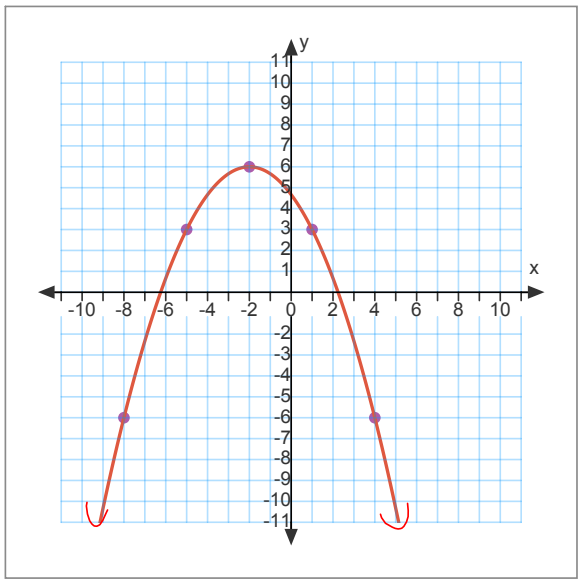
V.C. by a factor of $\frac{1}{3}$

h.t. 2 units to the left

v.t. 6 units up

MG: $y = x^2$

OVER	UP	
1	1	$a = -\frac{1}{3}$
2	4	$\rightarrow -\frac{4}{3}$
3	9	$\rightarrow -3$
4	16	
5	25	
6	36	$\rightarrow -12$



Test $x = -5$

$y = -\frac{1}{3}(-5+2)^2 + 6$

$= -\frac{1}{3}(-3)^2 + 6$

$= -\frac{1}{3}(9) + 6$

$= -3 + 6$

$= 3$

Ex.2:
Write the quadratic relation that has had a **vertical stretch by a factor of 6**,
a vertical translation down 3 units, and **a horizontal translation 8 units to the left**.

$$f(x) = 6(x+8)^2 - 3$$

Ex. 3 i) Use transformations to sketch each graph.
ii) State the Domain and Range.

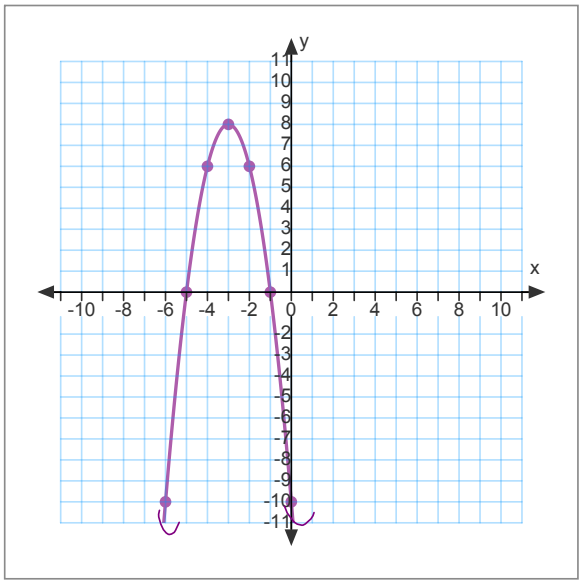
$g(x) = \frac{1}{4}(x+2)^2 - 7$

a) $f(x) = -2(x+3)^2 + 8$

MG $a = -2$ vertex $(-3, 8)$

1 $\rightarrow -2$
2 $4 \rightarrow -8$
3 $9 \rightarrow -18$

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



Domain: $\{x \in \mathbb{R}\}$

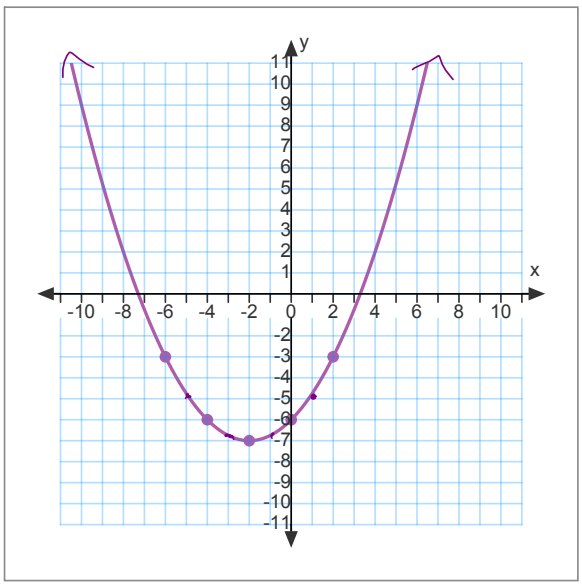
Range: $\{y \in \mathbb{R} \mid y \leq 8\}$

b) $g(x) = -7 + \frac{1}{4}(x+2)^2$

MG $a = \frac{1}{4}$ vertex $(-2, -7)$

1 → 1
2 → 4 → 1
3 → 9 →
4 → 16 → 4

$y = \frac{1}{4}(x+2)^2 - 7$



Domain: $\{x \in \mathbb{R}\}$

Range: $\{y \in \mathbb{R} \mid y \geq -7\}$

$g(2) = \frac{1}{4}(2+2)^2 - 7$

$= \frac{1}{4}(4)^2 - 7$

$= \frac{1}{4}(16)^4 - 7$

$= 4 - 7$

$= -3$

$g(2) = -3$

Ex. 3 i) Use transformations to sketch each graph.
ii) State the Domain and Range.

c) $h(x)=\frac{1}{5}(x-1)^2-11$

MG $a=\frac{1}{5}$ vertex $(1, -11)$

5 25 → 5

10 100 → 20

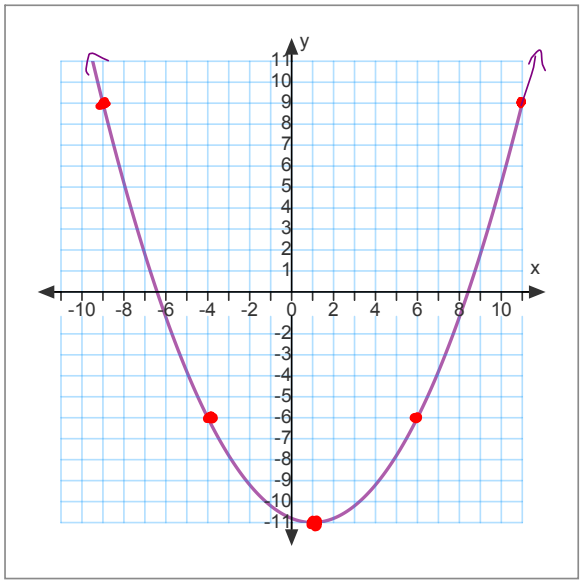
d) $d(x)=-\frac{1}{3}(x+1)^2+10$

MG $a=\frac{-1}{3}$ vertex $(-1, 10)$

3 9 → −3

6 36 → −12

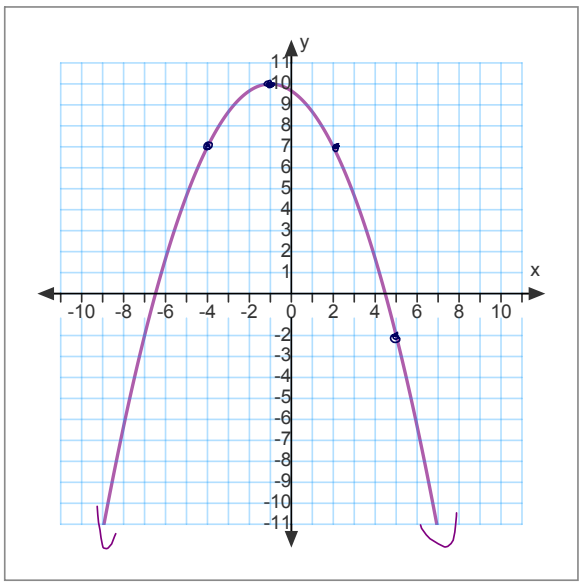
$y=\frac{1}{5}(x-1)^2-11$



Domain: $\{x \in \mathbb{R}\}$

Range: $\{y \in \mathbb{R} \mid y \geq -11\}$

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



Domain: $\{x \in \mathbb{R}\}$

Range: $\{y \in \mathbb{R} \mid y \leq 10\}$

Practice: pp. 56-58 #1 – 7