

## 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.

MCF 3MI

### 1.5 Graphing Quadratic Functions Using Transformations

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

Date: Feb. 18/20  
(Every lesson)

Correct yesterday's worksheet:

**a -- p. 39 E,F**

**h -- p. 39 C,D**

**k -- p. 38 A,B**

**You will be completing an EXIT card 10 minutes before class finishes.**

Possible Transformations: (RST)

R: reflection in the  $x$ -axis

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

S: vertical stretch (v.s.) by a factor of \_\_\_\_\_

OR vertical compression (v.c.) by a factor of \_\_\_\_\_

T: horizontal translation (h.t.) \_\_\_\_\_ units to the right or left

T: vertical translation (v.t.) \_\_\_\_\_ units to up or down

Ex. 1 i) Identify the values of the parameters  $a$ ,  $h$ , and  $k$ .vertex  $(h, k)$ 

ii) Identify the transformations.

iii) Use transformations to sketch each graph.

iv) State the Domain and Range.

a)  $f(x) = (x - 3)^2 + 4$  vertex  $(3, 4)$

$a = 1$ ,  $h = 3$ ,  $k = 4$

 $\hookrightarrow$  No v.s.  $\therefore$  congruent to  $y = x^2$ MG h.t. 3 units to the right  
V.t. 4 units up

3 9

b)  $g(x) = (x + 2)^2 + 1$  vertex  $(-2, 1)$

$a = 1$ ,  $h = -2$ ,  $k = 1$

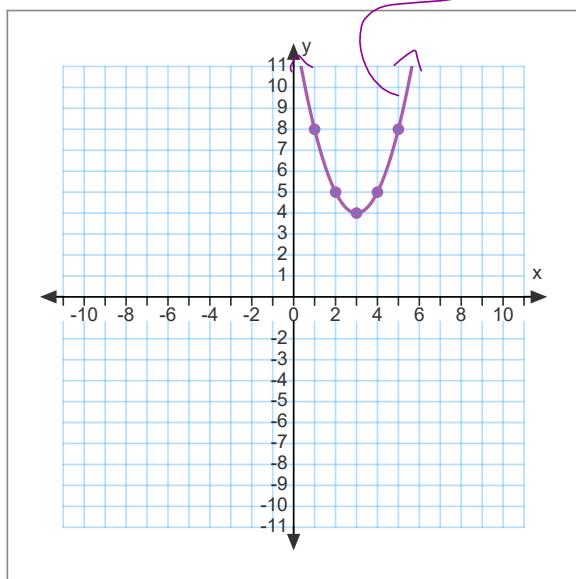
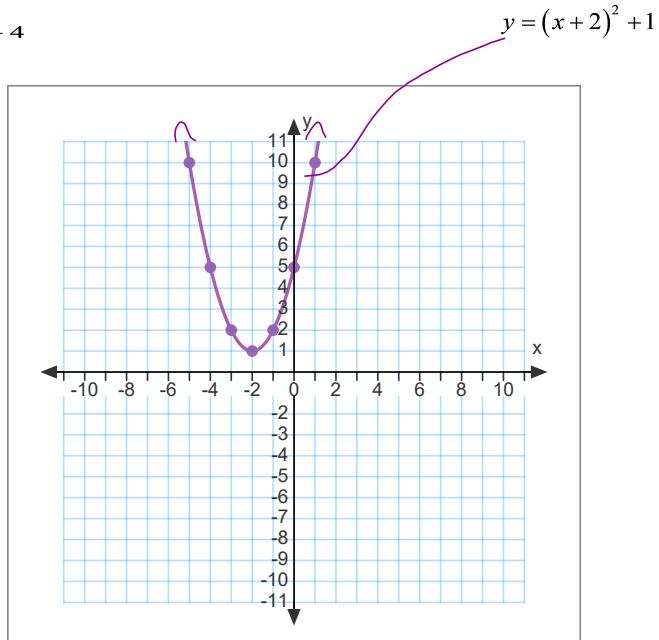
 $\hookrightarrow$  congruent to  $y = x^2$ 

h.t. 2 units to the left

v.t. 1 unit up

MG

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

Domain:  $\{x \in \mathbb{R}\}$ Range:  $\{y \in \mathbb{R} | y \geq 4\}$ Domain:  $\{x \in \mathbb{R}\}$ Range:  $\{y \in \mathbb{R} | y \geq 1\}$

Ex. 1 (cont'd)

- Identify the values of the parameters  $a$ ,  $h$ , and  $k$ .
- Identify the transformations.
- Use transformations to sketch each graph.
- State the Domain and Range.

c)  $h(x) = -(x-4)^2 - 2$  vertex (4, -2) d)  $i(x) = -(x+3)^2 + 0$  vertex (-3, 0)

$a = -1$ ,  $h = 4$ ,  $k = -2$

reflection in the  $x$ -axis

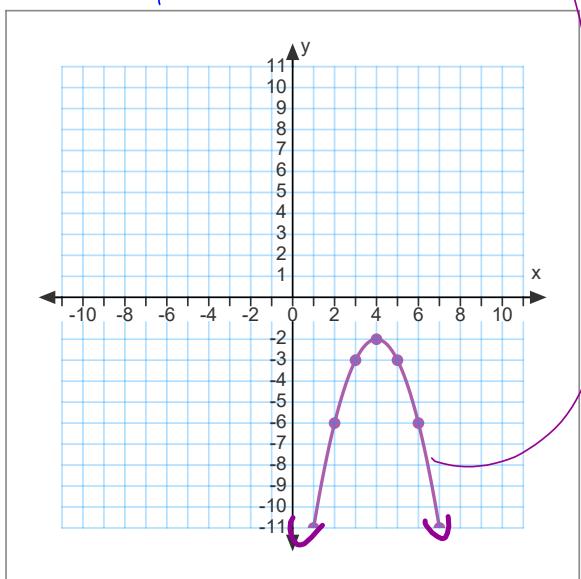
MG } ht 4 units right  
V.t. -2 units down  
 $a = -1$   
1 1  $\rightarrow -1$   
2 4  $\rightarrow -4$   
3 9  $\rightarrow -9$

$a = -1$ ,  $h = -3$ ,  $k = 0$

reflection in the  $x$ -axis

MG  $a = -1$  h.t. 3 units left  
1  $\rightarrow -1$  m. v.t.  
2  $\rightarrow -4$   
3  $\rightarrow -9$

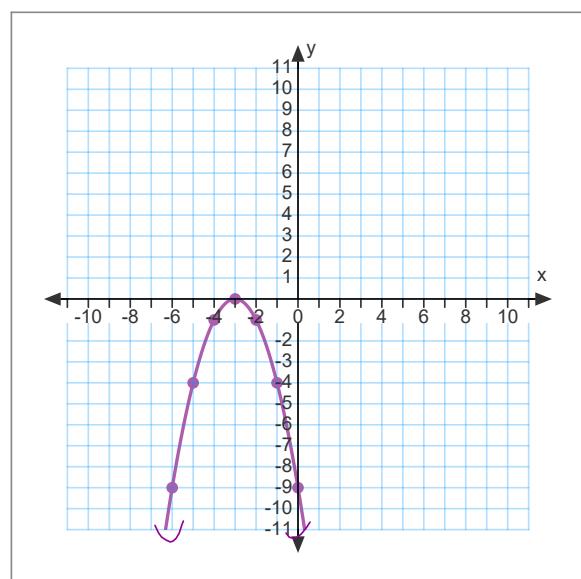
$y = -(x+3)^2$



\*\* Check using 1 (non-vertex) point

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

Range:  $\{y \in \mathbb{R} | y \leq -2\}$



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

Range:  $\{y \in \mathbb{R} | y \leq 0\}$

Ex. 1 (cont'd)

i) Identify the values of the parameters  $a$ ,  $h$ , and  $k$ .

ii) Identify the transformations.

iii) Use transformations to sketch each graph.

iv) State the Domain and Range.

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

e)  $j(x) = x^2 + 2$  vertex  $(0, 2)$   
 $a = 1$ ,  $h = 0$ ,  $k = 2$

No v.s. or v.c. or reflection

No h.t.

V.t. 2 units up

f)  $k(x) = -x^2 + 2$  vertex  $(0, 2)$   
 $a = -1$ ,  $h = 0$ ,  $k = 2$

Reflection in the x-axis

No h.t.

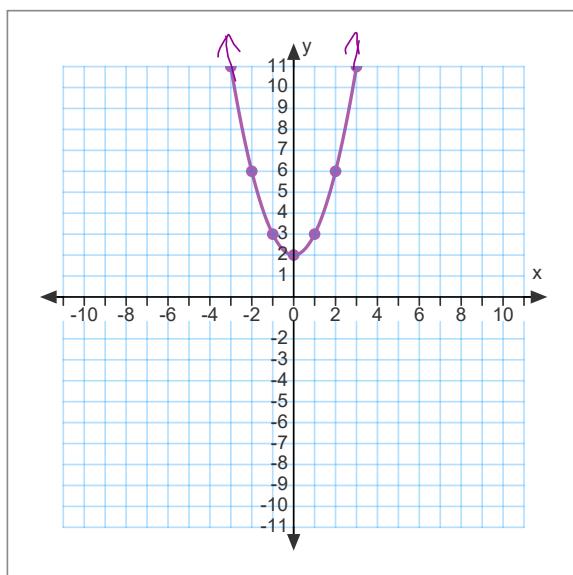
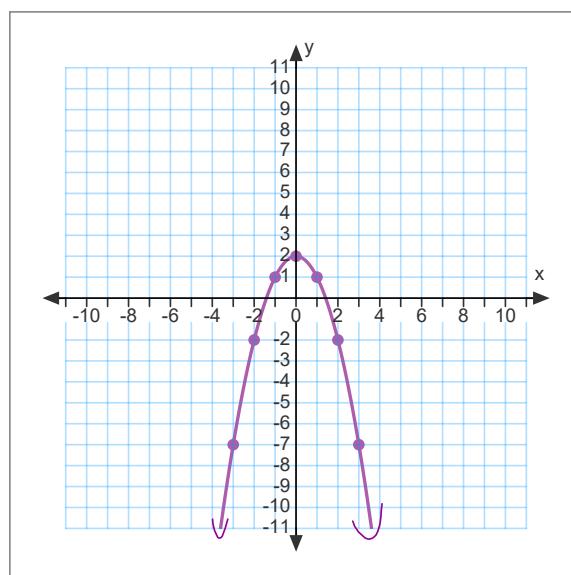
V.t. 2 units up

MG

MG  $\rightarrow a = -1$ 

$$y = x^2 + 2$$

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

Domain:  $\mathbb{R}$ Range:  $\{y \in \mathbb{R} | y \geq 2\}$ Domain:  $\mathbb{R}$ Range:  $\{y \in \mathbb{R} | y \leq 2\}$

**Assigned Practice:**

**READ** p.46 “In Summary” **CAREFULLY**, and ask me if anything is unclear!

- i) Complete the CheckPoint/Exit Card and submit it to the teacher

**BEFORE the end of class!**

- ii) Sketch the 2 functions on the bottom of the handout.

(on next screen,

and next class' file.)

- ii) Complete: p. 40 # 1

pp. 47-49 # 1, 2\*, 9

\*for 2iii) use graph paper to sketch by hand, then check using **desmos**

Additional homework questions from the bottom of the handout:

$$1. \quad a(x) = -(x+5)^2 - 3 \quad \text{vertex } ( \quad , \quad )$$

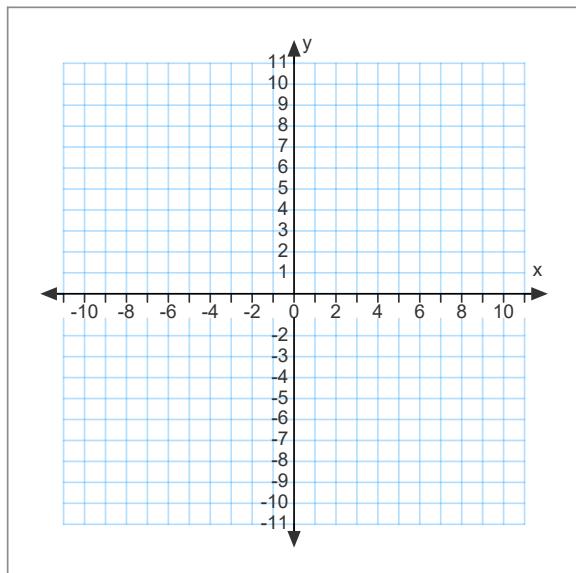
$a = \underline{\hspace{2cm}}$ ,  $h = \underline{\hspace{2cm}}$ ,  $k = \underline{\hspace{2cm}}$

$$2. \quad b(x) = 2(x-1)^2 - 7 \quad \text{vertex } ( \quad , \quad )$$

$a = \underline{\hspace{2cm}}$ ,  $h = \underline{\hspace{2cm}}$ ,  $k = \underline{\hspace{2cm}}$

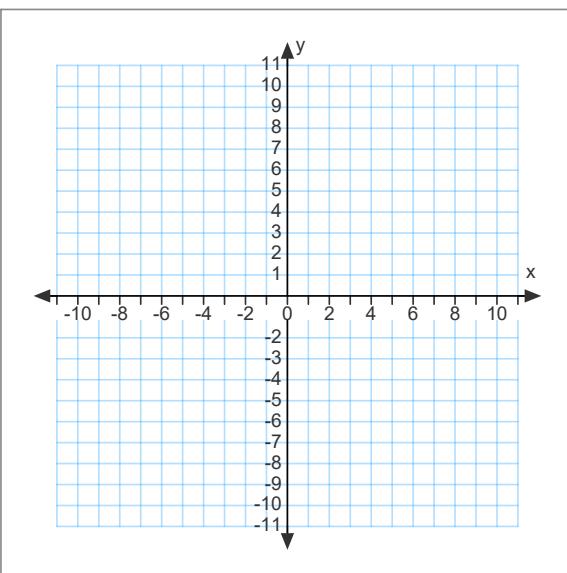
MG

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



MG

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



Domain: \_\_\_\_\_

Domain: \_\_\_\_\_

Range: \_\_\_\_\_

Range: \_\_\_\_\_