

**LESSON**  
**1-3**

# Transformations of Function Graphs

## Reteach

### Horizontal Translation

$$f(x) \rightarrow f(x - h)$$

Shifts  $x$  and  $f(x)$  right  $h$  units for  $h > 0$

Shifts  $x$  and  $f(x)$  left  $|h|$  units for  $h < 0$

### Vertical Translation

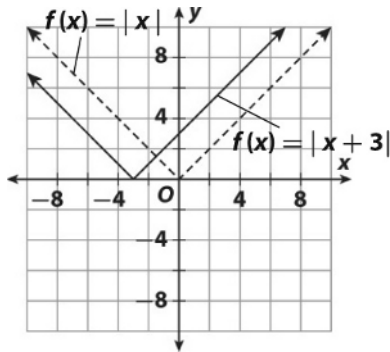
$$f(x) \rightarrow f(x) + k$$

Shifts  $f(x)$  up  $k$  units for  $k > 0$

Shifts  $f(x)$  down  $|k|$  units for  $k < 0$

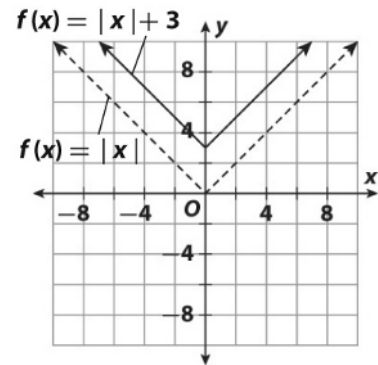
### Example

$f(x) = |x + 3|$  Graph shifts left 3 units.



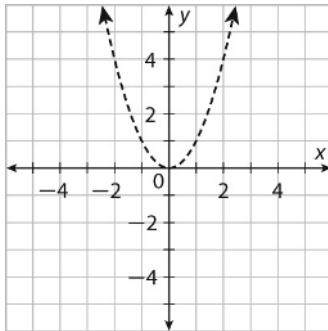
### Example

$f(x) = |x| + 3$  Graph shifts up 3 units.

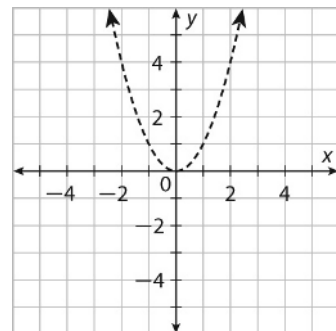


Describe the translation of  $f(x) = x^2$  and sketch the graph of the translated function.

1.  $f(x) = (x + 1)^2$  \_\_\_\_\_

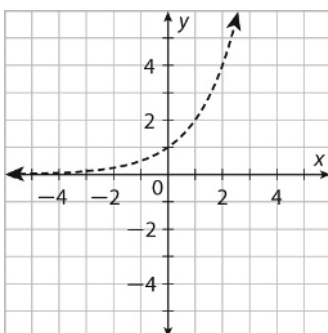


2.  $f(x) = x^2 - 2$  \_\_\_\_\_

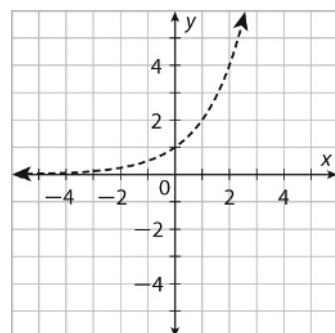


Describe the translation of  $f(x) = 2^x$  and sketch the graph of the translated function.

3.  $f(x) = 2^x - 4$  \_\_\_\_\_



4.  $f(x) = 2^{x-1}$  \_\_\_\_\_



# Answer Key

## Reteach

### Reteach 1-1

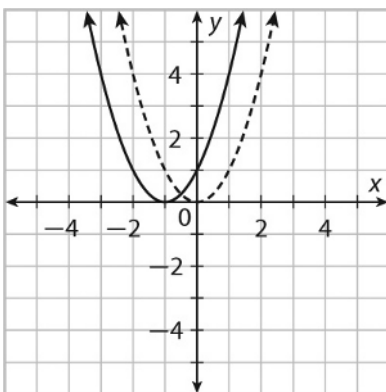
- $(-\infty, -2]$
- $(0, 3]$
- $+\infty; +\infty$
- $-\infty; -\infty$

### Reteach 1-2

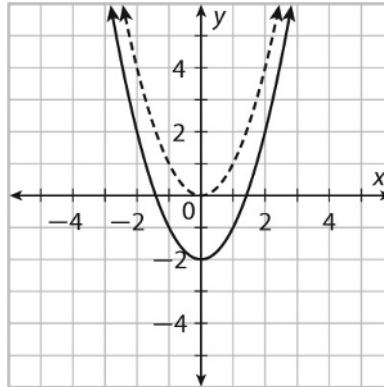
- $(-\infty, +\infty)$   
0  
 $(0, +\infty)$   
 $(-\infty, 0)$   
0; 0
- $(-\infty, +\infty)$   
none  
none  
none  
 $(-\infty, +\infty)$   
none

### Reteach 1-3

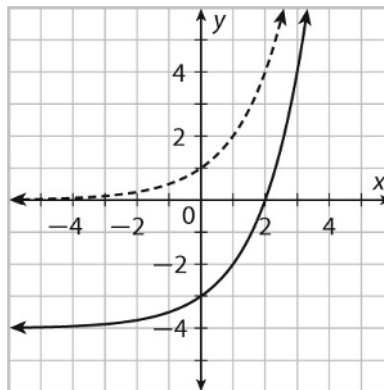
- Graph shifts left 1 unit



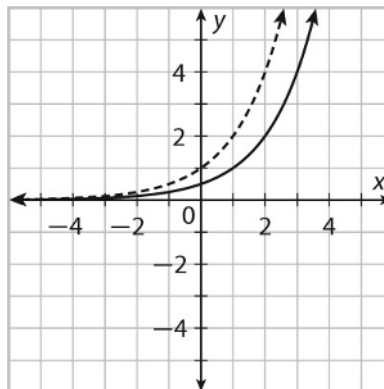
- Graph shifts down 2 units



- Graph shifts down 4 units



- Graph shifts right 1 unit



### Reteach 1-4

- $f^{-1}(x) = \frac{x-5}{2}$
- $f^{-1}(x) = -\frac{x-8}{3}$