

What you will learn about:  
Transformations of Functions

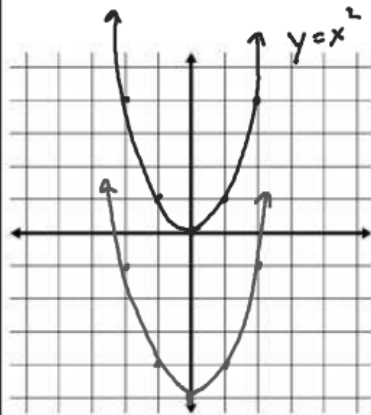
Parent Function

Linear  $y = x$

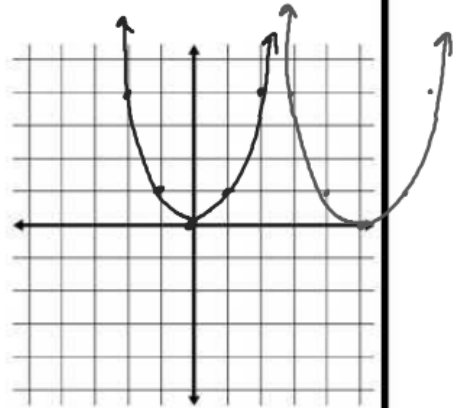
Quad  $y = x^2$

Describe how the graph of  $y = x^2$  can be transformed to the graph of the given equation.

A)  $y = x^2 - 5$   
Shifted Down 5

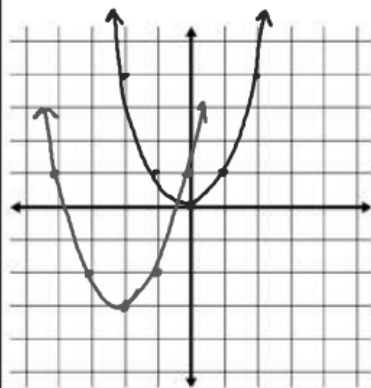


B)  $y = (x - 5)^2$   
Shifted Right 5



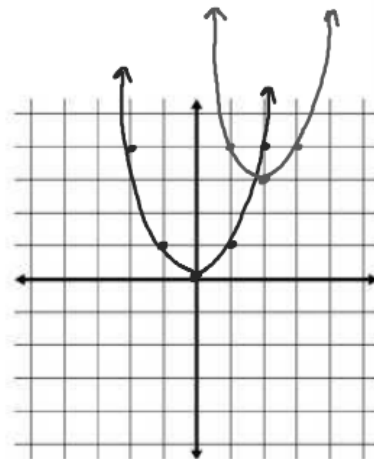
C)  $y = (x + 2)^2 - 3$

Shifted Left 2  
Down 3



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

Shifted  
Right 2  
up 3



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

$a < 0$  Reflection over x-axis

$a > 1$  Vertical Stretch

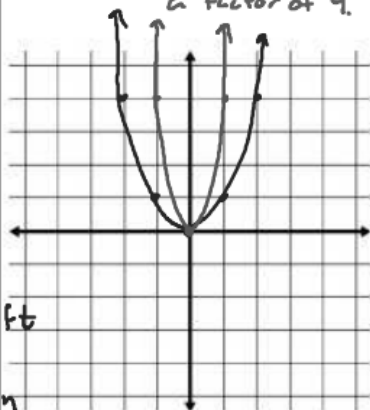
$0 < a < 1$  Vertical Compression

$h$  → Shift Right/Left

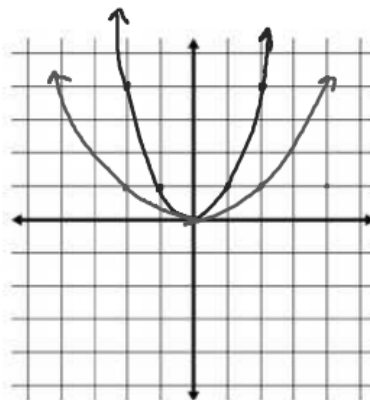
$k$  → Shift up/down

Describe how the graph of  $y = x^2$  can be transformed to the graph of the given equation.

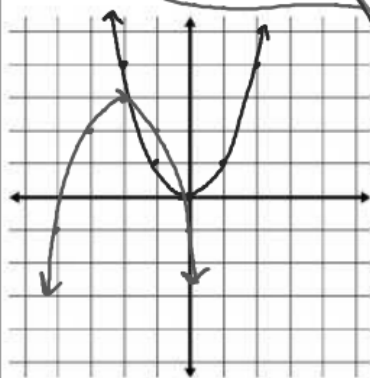
E)  $y = 4x^2$  Vertical Stretch by a factor of 4.



F)  $y = \frac{1}{4}x^2$  Vertical Compression by a factor of  $\frac{1}{4}$



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



→ Reflection over x-axis

→ Shift Left 2

→ Up 3

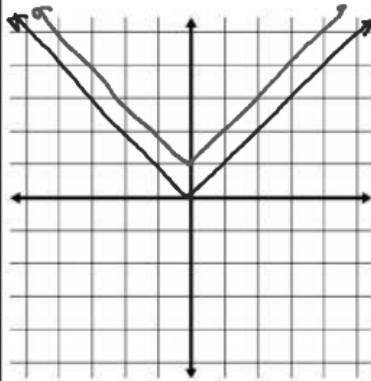
$|x| \rightarrow$  absolute value

$$|3| = 3$$

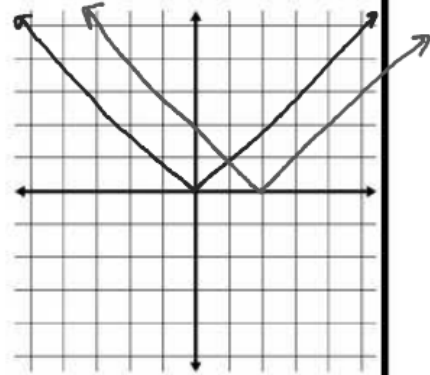
$$|-3| = 3$$

Describe how the graph of  $y = |x|$  can be transformed to the graph of the given equation.

A)  $y = |x| + 1$   
Shifted up 1

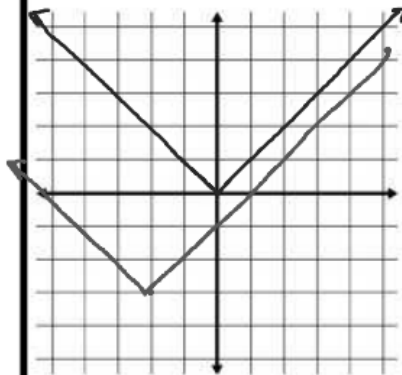


B)  $y = |x - 2|$   
Shifted right 2

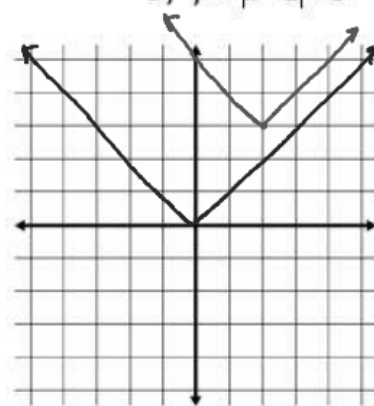


Shifted left 2  
Down 3

C)  $y = |x + 2| - 3$



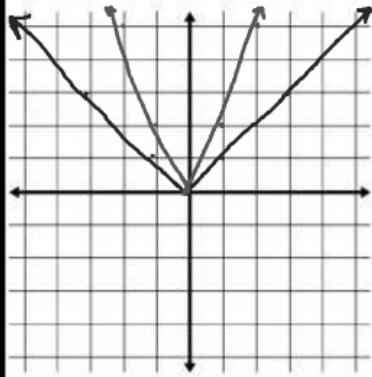
D)  $y = |x - 2| + 3$



Shifted  
Right 2  
up 3

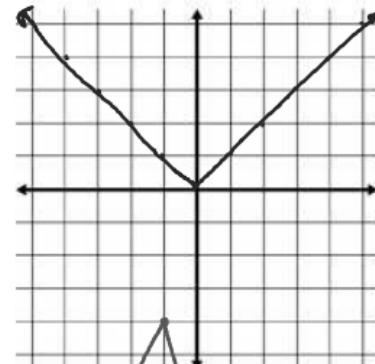
$$y = a|x-h| + k$$

E)  $y = 2|x|$



Vertical Stretch by  
factor of 2

F)  $y = -3|x+1| - 4$



Vertical Stretch by factor of 3  
Reflection over x-axis  
Shifted Left 1 and Down 4