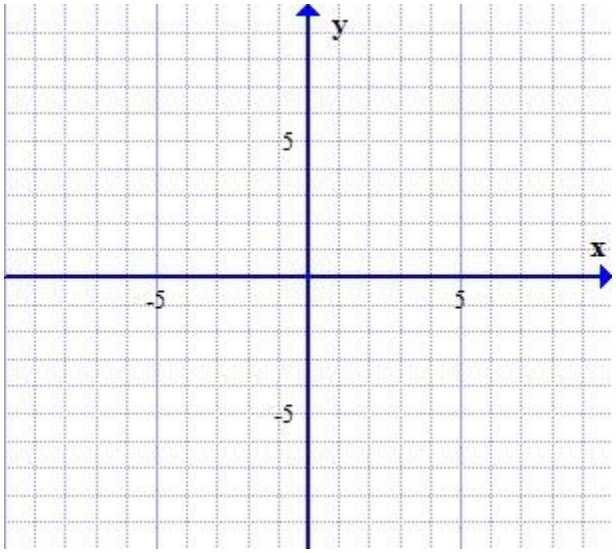
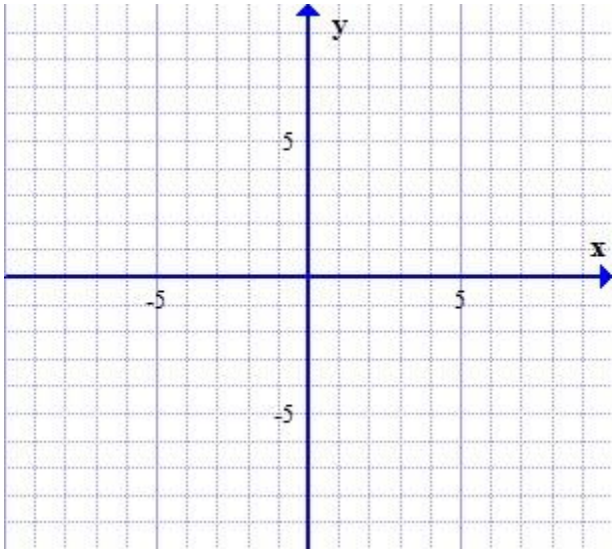
Transformations. Part 1: Vertical and Horizontal Translations

Graph: $y = x^2$, $y = x^2 + 1$ and $y = x^2 - 1$ on the same grid



Graph: $y = x^2$, $y = (x + 1)^2$ and $y = (x - 1)^2$ on the same grid



Rule:

1) Given the function $y = f(x)$, write the equation of the transformed function after each of the following translations:

a) Vertical translation of 3 units down

b) Horizontal translation of 4 units to the right

c) A horizontal translation of 2 units to the left and a vertical translation of 5 units up.

2) Describe how the graph of y=$f(x-4)+2$ can be obtained from the graph of $y = f(x)$.

3) Find the coordinates of the second point

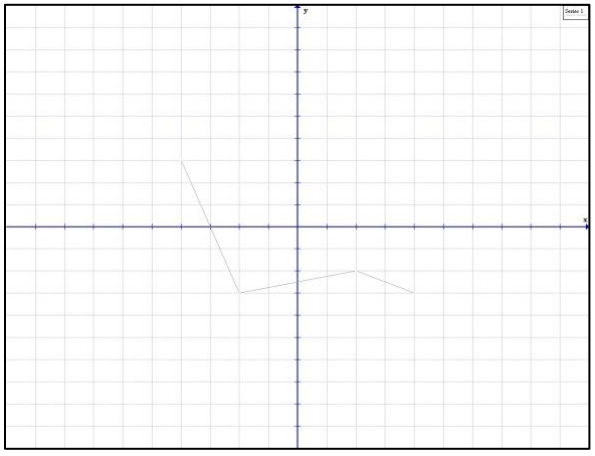
a) A horizontal translation of 2 units to the left $(3,-5) \rightarrow (\quad , \quad)$

b) A horizontal translation 3 units to the right and a vertical translation 2 units down

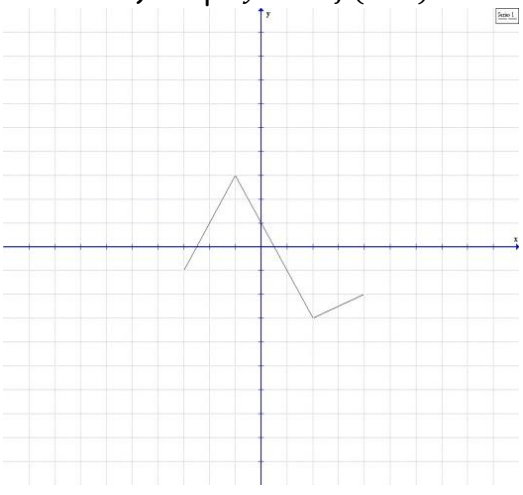
$(-4,2) \rightarrow (\quad , \quad)$

c) Describe the translations that transform point$(-6,-3)\ into\ (5,-2)$

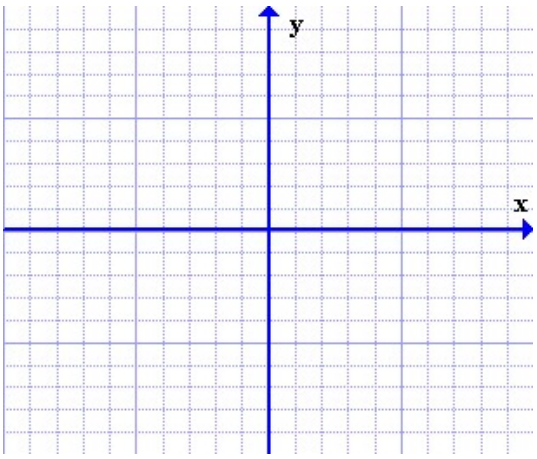
4) Graph $y = f(x) + 2$



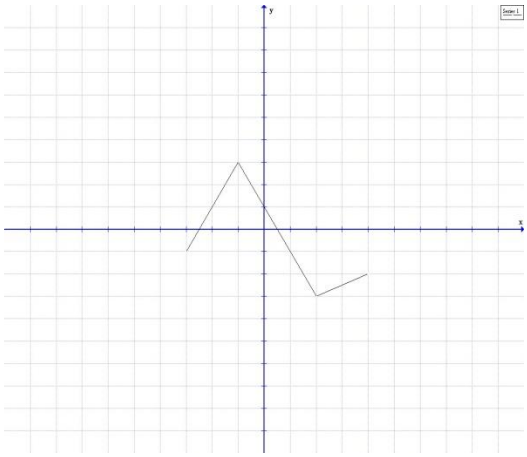
5) Graph $y-3 = f(x-2)$



6) Graph $y + 3 = \sqrt{x + 4}$



7) Graph $y + 2 = f(x - 5)$



8) Describe how the graph $y + 2 = f(x - 1) - 7$ relates to the graph of $y = f(x)$

9) The function $y = f(x)$ is transformed to $y = f(x + 2) + 3$. If the point (2 , –1) lies on the graph of $y = f(x)$, determine the point that must lie on the transformed graph.

10) The function $y = f(x)$ is transformed to $y - 3 = f(x - 2)$. If the point (-3, 4) lies on the graph of $y - 3 = f(x - 2)$, determine the point that must lie on the graph of y= $f(x)$.

11) What happens to the graph of the function $y = f(x)$ if you replace x with $x + 4$ and y with $y - 5$?

12) Describe how the graph of the second function compares to the graph of the first function:

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

13) Write the equation of the image $of\ y = \frac{1}{\sqrt{x}}$ after a horizontal translation of 3 units to the left and a vertical translation of 2 units up.

14) The function F(x) =$\sqrt{x}$+3 is transformed by a translation of 3 units down and 4 units to the left. The transformed function passes through the point (15, y). Determine the value of y.

15) What vertical translation would be applied to $y = x^2$ so that the translation image passes through (3, 5)?

16) What horizontal translation would be applied to $y = \frac{1}{x-3}$ so that the translation image passes through $(1, \frac{1}{2})$?