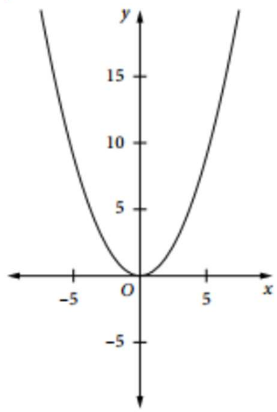
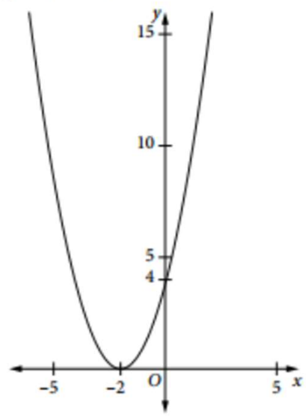
TRANSFORMATIONS OF GRAPHS USING $y = f(x + b)$ AND $y = f(x) + c$

Consider the following graphs:

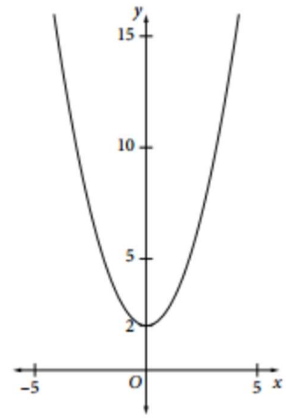
$y = x^2$



$y = (x + 2)^2$



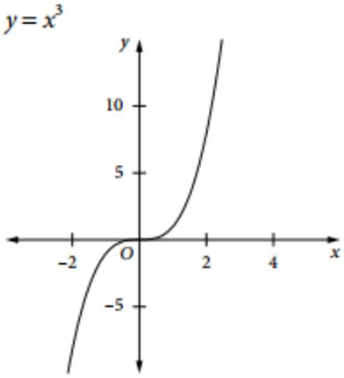
$y = x^2 + 2$



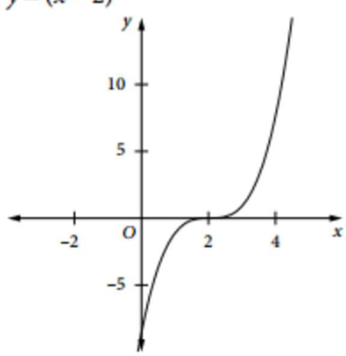
If $y = x^2$ is written as $y = f(x)$ then $y = (x + 2)^2$ becomes $y = f(x + 2)$ and $y = x^2 + 2$ becomes $y = f(x) + 2$.
In $y = f(x + 2)$ the curve for $y = f(x)$ has been moved 2 units to the left, (0, 0) moved to (−2, 0).
In $y = f(x) + 2$ the curve for $y = f(x)$ has been moved 2 units upwards, (0, 0) moved to (0, 2).

Now consider the following similar graphs:

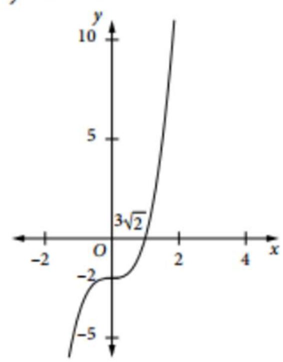
$y = x^3$



$y = (x - 2)^3$



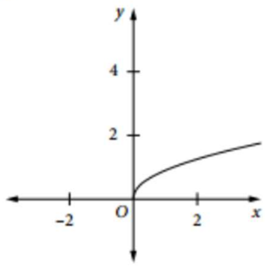
$y = x^3 - 2$



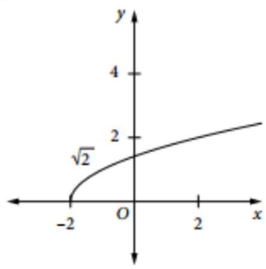
If $y = x^3$ is written as $y = f(x)$ then $y = (x - 2)^3$ becomes $y = f(x - 2)$ and $y = x^3 - 2$ becomes $y = f(x) - 2$.
In $y = f(x - 2)$ the curve for $y = f(x)$ has been moved 2 units to the right, (0, 0) moved to (2, 0).
In $y = f(x) - 2$ the curve for $y = f(x)$ has been moved 2 units downwards, (0, 0) moved to (0, −2).

In the cases above, the same function is translated horizontally and vertically by changing the function. The same changes may also be applied to functions involving square roots, for example:

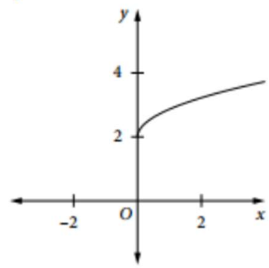
$y = \sqrt{x}$



$y = \sqrt{x + 2}$



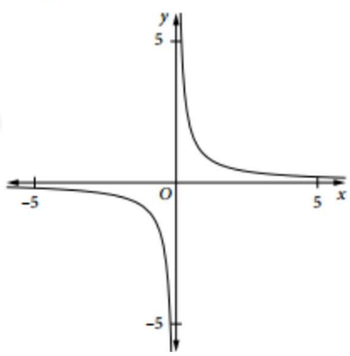
$y = \sqrt{x} + 2$



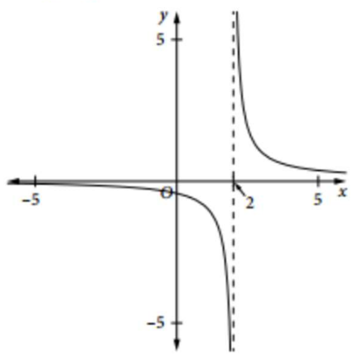
If $y = \sqrt{x}$ is written as $y = f(x)$ then $y = \sqrt{x + 2}$ becomes $y = f(x + 2)$ and $y = \sqrt{x} + 2$ becomes $y = f(x) + 2$.
In $y = f(x + 2)$ the curve for $y = f(x)$ has been moved 2 units to the left, (0, 0) moved to (−2, 0).
In $y = f(x) + 2$ the curve for $y = f(x)$ has been moved 2 units upwards, (0, 0) moved to (0, 2).

Similarly, consider the following reciprocal functions:

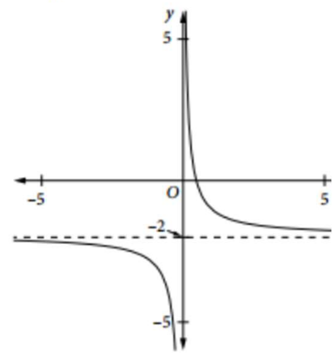
$y = \frac{1}{x}$



$y = \frac{1}{x - 2}$



$y = \frac{1}{x} - 2$



If $y = \frac{1}{x}$ is written as $y = f(x)$ then $y = \frac{1}{x - 2}$ becomes $y = f(x - 2)$ and $y = \frac{1}{x} - 2$ becomes $y = f(x) - 2$.
In $y = f(x - 2)$ the curve for $y = f(x)$ has been moved 2 units to the right.
In $y = f(x) - 2$ the curve for $y = f(x)$ has been moved 2 units downwards.

Another example