

## Translations of Sinusoidal Functions

For the equation  $y = \sin(x - d) + c$  and  $y = \cos(x - d) + c$ ,

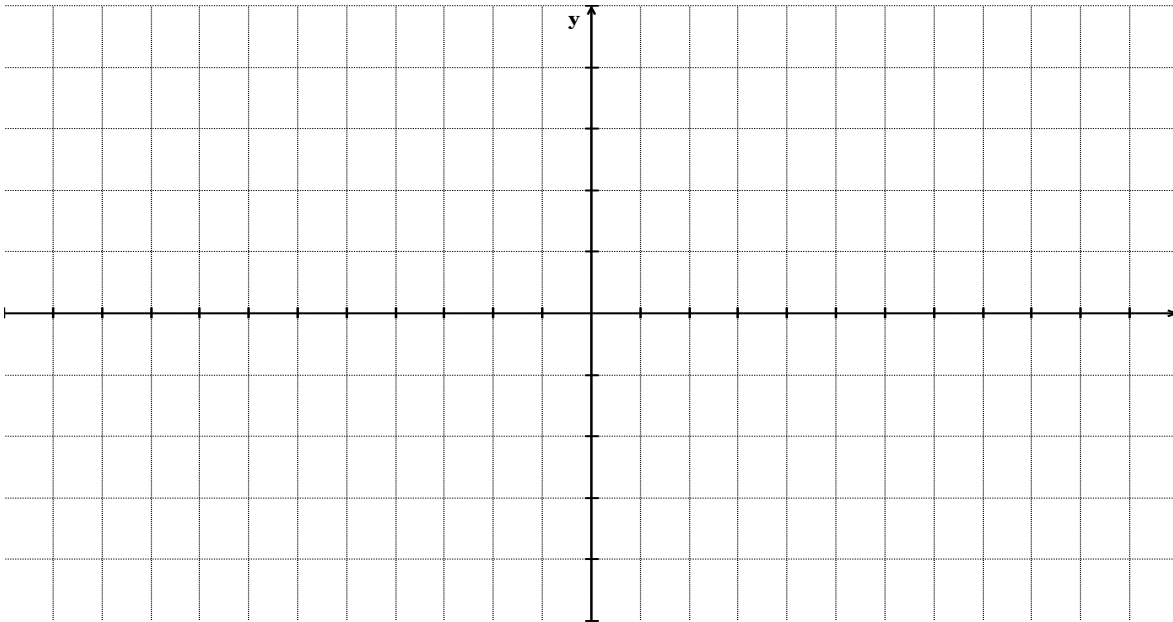
When:  $d > 0$ , the function is **translated  $d$  units right**

$d < 0$ , the function is **translated  $d$  units left**

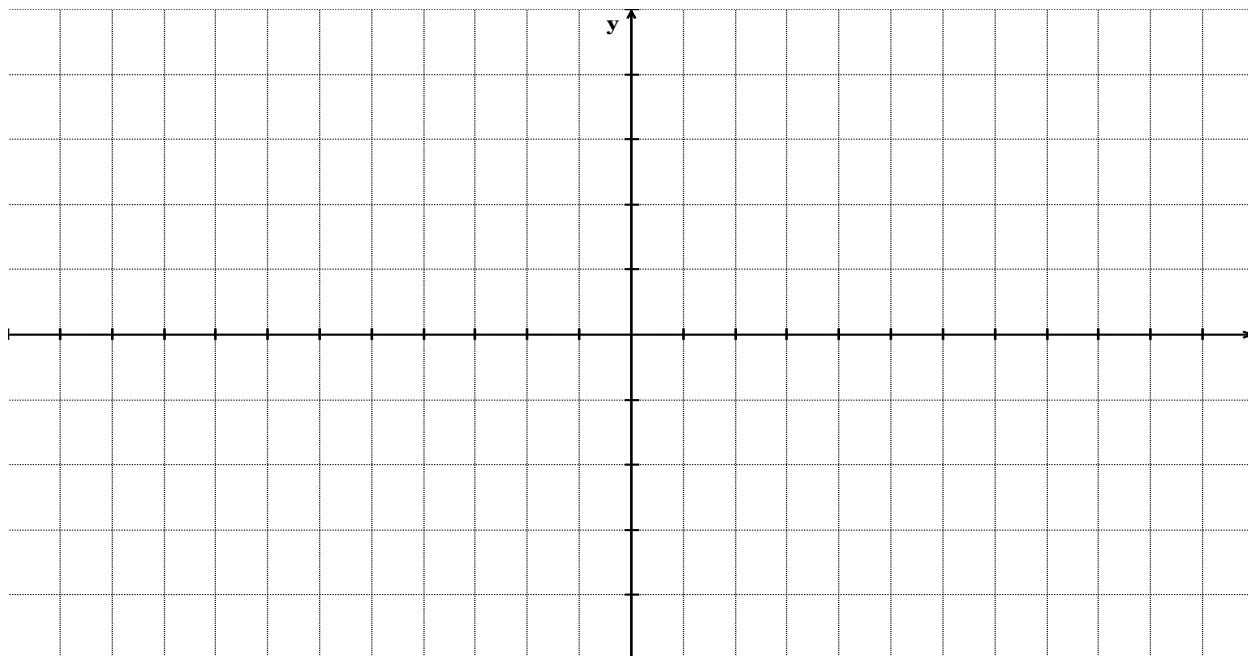
$c > 0$ , the function is **translated  $c$  units up**

$c < 0$ , the function is **translated  $c$  units down**

**Example 1** Graph one cycle of the function  $y = \cos(x - 30^\circ) + 2$ .



**Example 2** Graph two cycles of the function  $y = \sin(x + 45^\circ) - 3$ .



**Example 3** Determine the equation for the given transformations described below:

a) A sine function that has been translated  $56^\circ$  right and 3 units down.

b) A cosine function has been translated  $120^\circ$  left and 2 units up.