

Graph Transformations *extend*

ANSWERS

1



$f(x) = x^2 - 2x - 3$. Write $y = f(x+1) - 4$ in the form $y = x^2 + bx + c$ and give the turning point of its graph.

$$(x+1)^2 - 2(x+1) - 3 - 4$$

$$= x^2 + 2x + 1 - 2x - 2 - 7$$

$$y = x^2 - 8; (0, -8)$$

Answer

2



The graph of $y = x^3$ is translated by $\begin{pmatrix} a \\ b \end{pmatrix}$. The new graph passes through $(1, 3)$ and $(3, 11)$. Find the two possible pairs of values of a and b .

$$(3-a)^3 - (1-a)^3 = 8$$

$$u = 1-a: 6u^2 + 12u = 0, u = 0 \text{ or } -2$$

$$a = 1, b = 3 \text{ or } a = 3, b = 11$$

Answer

3



The graph of $y = f(x)$ has a maximum point at $(3, 5)$. Find the turning point of $y = -f(x-1) + 4$ and say whether it is a maximum or a minimum.

$$(3, 5) \rightarrow (4, 5) \rightarrow (4, -5) \rightarrow (4, -1)$$

the reflection turns the maximum into a minimum

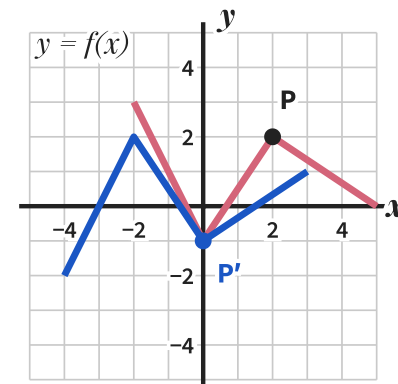
$$\text{Minimum at } (4, -1)$$

Answer

4



Sketch $y = -f(x+2) + 1$ and label where P goes.



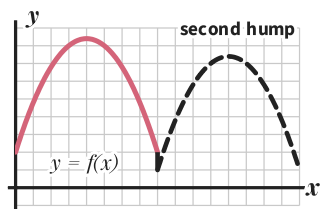
$$P \text{ goes to } (0, -1)$$

Answer

5



A roller coaster's first hump is $y = 0.4x(8-x) + 2$ for $0 \leq x \leq 8$. The second hump (dashed) is the first one moved 8 m right and 1 m down. Write its equation as $y = ax^2 + bx + c$.



$$f(x-8) - 1 = 0.4(x-8)(16-x) + 1$$

$$y = -0.4x^2 + 9.6x - 50.2$$

Answer

6



$f(x) = x^2 - 6x$. Show that the graph of $y = f(-x)$ is the graph of $y = f(x)$ translated 6 units to the left.

$$f(-x) = x^2 + 6x$$

$$f(x+6) = (x+6)^2 - 6(x+6) = x^2 + 6x$$

$$f(-x) = f(x+6) = x^2 + 6x$$

Show

7



The graph of $y = \sin x$ is reflected in the y axis and then translated by $\begin{pmatrix} 180 \\ 0 \end{pmatrix}$. Write the equation of the new graph and show that it is $y = \sin x$ again.

$$\sin(-x), \text{ then } x \rightarrow x - 180$$

$\sin(180^\circ - x)$: the graph is symmetrical about 90°

$$y = \sin(180^\circ - x) = \sin x$$

Show

8



$f(x) = x^2 - 2x - 8$. Find where the graph of $y = f(x)$ meets its reflection in the y axis, and where it meets its reflection in the x axis. Explain why the second set are on the x axis.

$$x^2 - 2x - 8 = x^2 + 2x - 8, \text{ so } x = 0$$

$$f(x) = -f(x) \text{ only when } f(x) = 0$$

$$(0, -8); (-2, 0) \text{ and } (4, 0)$$

Answer