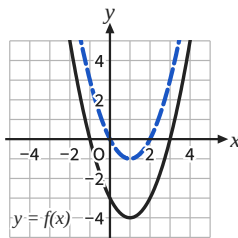


1 Graph transformations

The grid shows $y = f(x)$.

- a) On the grid, sketch $y = f(x) + 3$.
b) Describe fully the single transformation that maps $y = f(x)$ onto $y = f(x + 4)$.



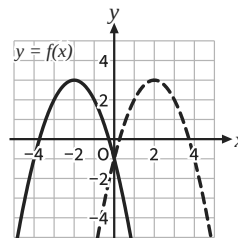
a) the same shape, lowest at $(1, -1)$

b) a translation by $\begin{pmatrix} -4 \\ 0 \end{pmatrix}$

2 Graph transformations

The dashed graph is a translation of $y = f(x)$.

- a) Write the equation of the dashed graph in terms of f .
b) Write down the maximum point of $y = f(x) - 5$.



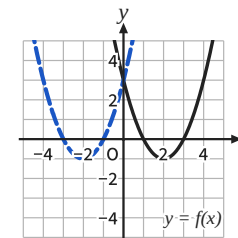
a) $y = f(x - 4)$

b) $(-2, -2)$

3 Graph transformations

The grid shows $y = f(x)$.

- a) On the grid, sketch $y = f(-x)$.
b) Which point on $y = f(x)$ stays where it is?



a) reflect it in the y axis: lowest at $(-2, -1)$

b) $(0, 3)$

4 Graph transformations

- a) The graph of $y = x^2$ is translated by $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$. Write its new equation in the form $y = x^2 + bx + c$.
b) The graph of $y = x^2 - 4$ is reflected in the x axis. Write the equation of the new graph.

a) $y = (x - 3)^2 - 1$
 $= x^2 - 6x + 8$

b) $y = 4 - x^2$

Transformations of functions revision mat answers

5 Where does the point go?

$P(-2, 5)$ is on the graph of $y = f(x)$. Find where P goes on the graph of

- a) $y = f(x - 1) + 2$
b) $y = f(-x) - 3$

a) right 1, up 2: $(-1, 7)$

b) reflect, then down 3: $(2, 2)$

6 Where does the point go?

The graph of $y = f(x)$ has a minimum point at $(2, -3)$.

- a) Write down the minimum point of $y = f(x + 5)$.
b) The minimum point of $y = f(x) + k$ is on the x axis. Find k .

a) left 5: $(-3, -3)$

b) up 3 to $(2, 0)$, so $k = 3$

7 Where does the point go?

- a) On a new graph, $(2, 5)$ on $y = f(x)$ goes to $(2, -5)$ and $(-1, 0)$ stays where it is. Write the new equation.
b) On $y = f(x) + b$, the point $(4, 1)$ goes to $(4, -6)$. Find b .

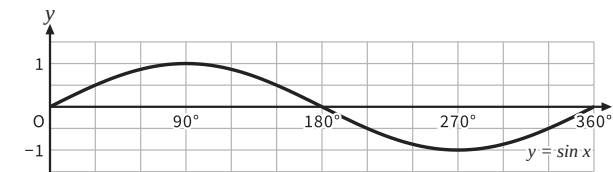
a) a reflection in the x axis:

$y = -f(x)$

b) down 7, so $b = -7$

8 Where does the point go?

- a) Write down the maximum point of $y = \sin x + 2$.
b) Write down the maximum point of $y = -\sin x$.



a) $(90^\circ, 1)$ moves up 2: $(90^\circ, 3)$

b) the minimum $(270^\circ, -1)$ flips: $(270^\circ, 1)$