

# GCSE Maths: Graph transformations (Higher): worksheet

GCSE Maths - Functions and Advanced Graphs - Higher - Lesson 25.4

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Score: \_\_\_\_\_

17 questions. Write your answers in the spaces. Answers and step-by-step help are free at [websink.site/gcse/maths/ch25-functions-advanced-graphs/higher/graph-transformations/](https://websink.site/gcse/maths/ch25-functions-advanced-graphs/higher/graph-transformations/)

## Exercise 25D Graph transformations Non-calculator

- 1 The graph of  $y = f(x)$  passes through A(1, 0), B(2, -1), C(3, 0) and D(0, 3). Find the coordinates of the images of A, B, C and D on the graph of

(a)  $y = f(x) + 3$

Answer: \_\_\_\_\_

(b)  $y = f(x - 2)$

Answer: \_\_\_\_\_

(c)  $y = -f(x)$

Answer: \_\_\_\_\_

(d)  $y = f(-x)$

Answer: \_\_\_\_\_

- 2 The graph of  $y = f(x) = x^3 - 3x^2$  passes through A(0, 0), B(2, -4) and C(3, 0). Find the images of A, B and C on

(a)  $y = f(x) - 2$

Answer: \_\_\_\_\_

(b)  $y = f(x + 1)$

Answer: \_\_\_\_\_

(c)  $y = 2f(x)$  (a stretch)

Answer: \_\_\_\_\_

(d)  $y = f(-x)$

Answer: \_\_\_\_\_

- 3  $f(x) = x^2 - 4x$ . Find, in expanded form, the equation of the graph

(a)  $y = f(x) + 3$

Answer: \_\_\_\_\_

(b)  $y = f(x - 2)$

Answer: \_\_\_\_\_

(c)  $y = -f(x)$

Answer: \_\_\_\_\_

(d)  $y = f(-x)$

Answer: \_\_\_\_\_

(e)  $y = 2f(x)$

Answer:

- 4 The graph of  $y = f(x)$  has a minimum point at  $(2, -1)$ . Write down the coordinates and type of the turning point of

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

Answer:

(b)  $y = f(x - 3)$

Answer:

(c)  $y = -f(x)$

Answer:

(d)  $y = f(2x)$  (a stretch)

Answer:

- 5 The graph of  $y = f(x)$  crosses the  $x$ -axis at  $x = 1$  and  $x = 3$ . Write down where the graph of each of these crosses the  $x$ -axis.

(a)  $y = f(x - 2)$

Answer:

(b)  $y = f(-x)$

Answer:

(c)  $y = -f(x)$

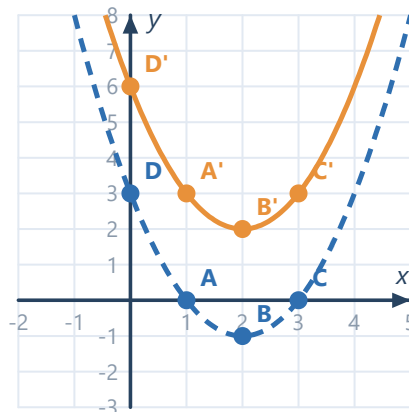
Answer:

(d)  $y = f(2x)$

Answer:

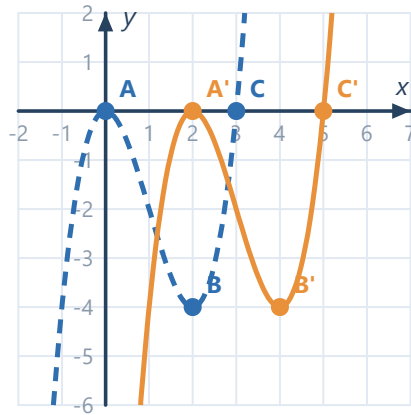
- 6 In each diagram the dashed graph is  $y = f(x)$  and the orange graph is a transformation of it. Describe the transformation fully and write the equation of the orange graph in terms of  $f$ .

(a)



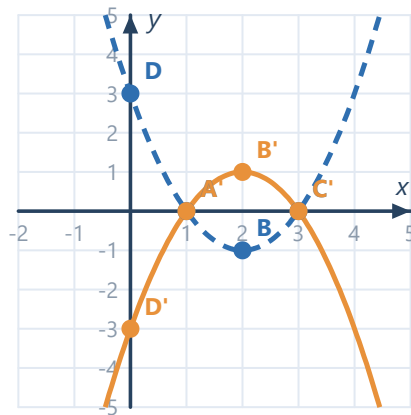
Answer:

(b)



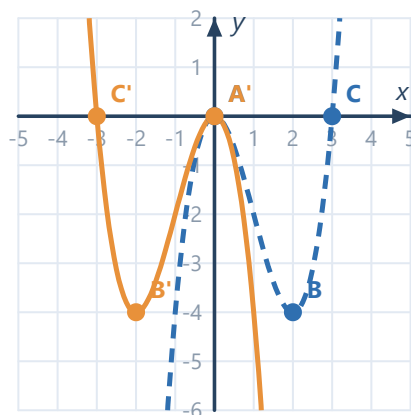
Answer:

(c)



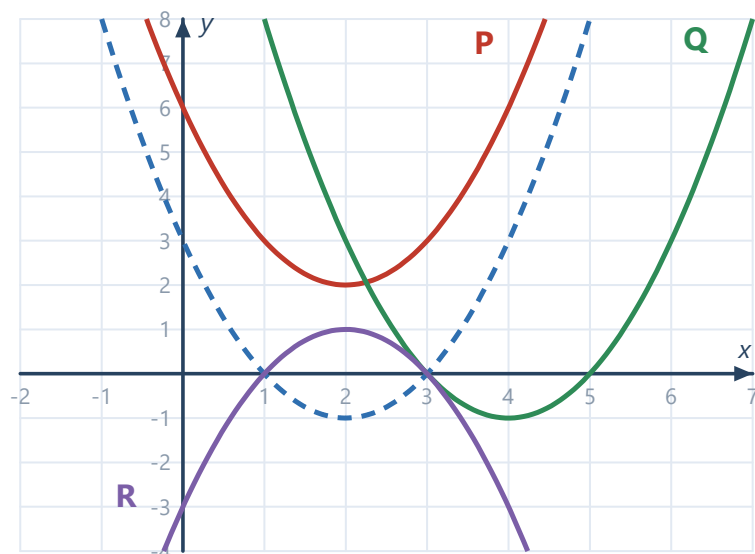
Answer:

(d)



Answer:

- 7 The dashed graph is  $y = f(x) = x^2 - 4x + 3$ . The graphs P, Q and R are transformations of it. Match each equation to a graph.



(a)  $y = f(x) + 3$

Answer:

(b)  $y = f(x - 2)$

Answer:

(c)  $y = -f(x)$

Answer:

- 8 The point (4, 7) is on the graph of  $y = f(x)$ . Write down the coordinates of the corresponding point on the graph of

(a)  $y = f(x) + 1$

Answer:

(b)  $y = f(x - 2)$

Answer:

(c)  $y = 2f(x)$

Answer:

(d)  $y = f(\frac{1}{2}x)$

Answer:

- 9 The graph of  $y = 1/x$  has asymptotes  $x = 0$  and  $y = 0$ . Write down the equations of the asymptotes of

(a)  $y = 1/x + 2$

Answer:

(b)  $y = 1/(x - 3)$

Answer:

(c)  $y = 1/(x + 1) - 4$

Answer:

(d)  $y = 1/(x - 2) + 1$

Answer:

- 10** Sketch the graph of  $y = 1/(x - 2) + 1$ . Mark the asymptotes and the points where the graph crosses the axes.

Answer: .....

- 11** Complete the square for each quadratic, and write down the coordinates of its turning point.

**(a)**  $y = x^2 + 6x + 11$

Answer: .....

**(b)**  $y = x^2 - 4x + 9$

Answer: .....

**(c)**  $y = x^2 + 8x + 20$

Answer: .....

**(d)**  $y = x^2 - 2x - 3$

Answer: .....

- 12** Describe the transformation that maps the graph of  $y = x^2$  onto the graph of  $y = (x - 3)^2 + 2$ .

Answer: .....

- 13** Explain why the graph of  $y = f(x + 3)$  is a translation of 3 units to the **left**, using  $f(x) = x^2$  as an example.

Answer: .....

- 14** For  $f(x) = x^3 - 3x^2$ , show that the graphs of  $y = -f(x)$  and  $y = f(-x)$  are **not** the same.

Answer: .....

- 15** The height, in metres, of a ball  $x$  seconds after it is thrown is  $h(x) = 8x - 5x^2$ . A second ball is thrown in exactly the same way but 1 second later. Find an expression for its height  $x$  seconds after the first ball was thrown.

Answer: .....

- 16** The graph of  $y = f(x)$  has a minimum at  $(3, -2)$ . The graph of  $y = f(x + a) + b$  has its minimum at  $(1, 5)$ . Find the values of  $a$  and  $b$ .

Answer: .....

- 17** The graph of  $y = x^2 - 4x + 3$  is reflected in the  $y$ -axis and then translated 2 units up. Find the equation of the final graph.

Answer: .....