

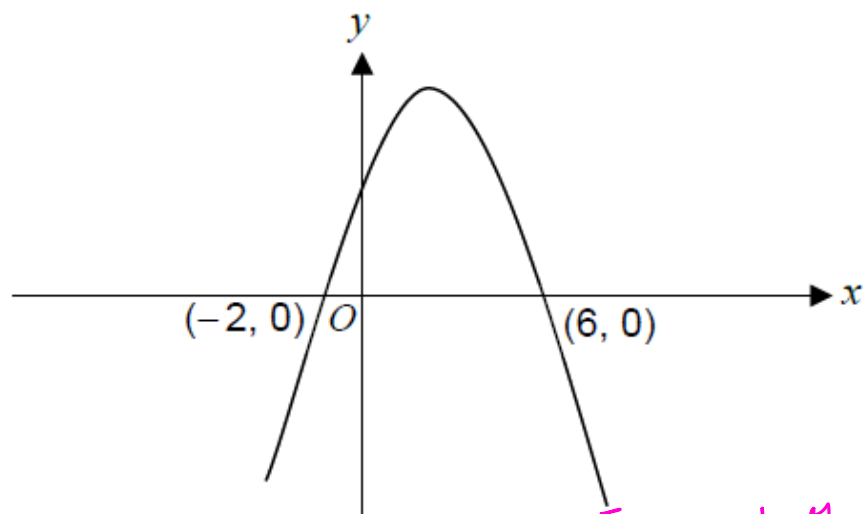
Functions (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

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Total Marks:	

1. (a) The diagram shows a sketch of the graph $y = f(x)$.

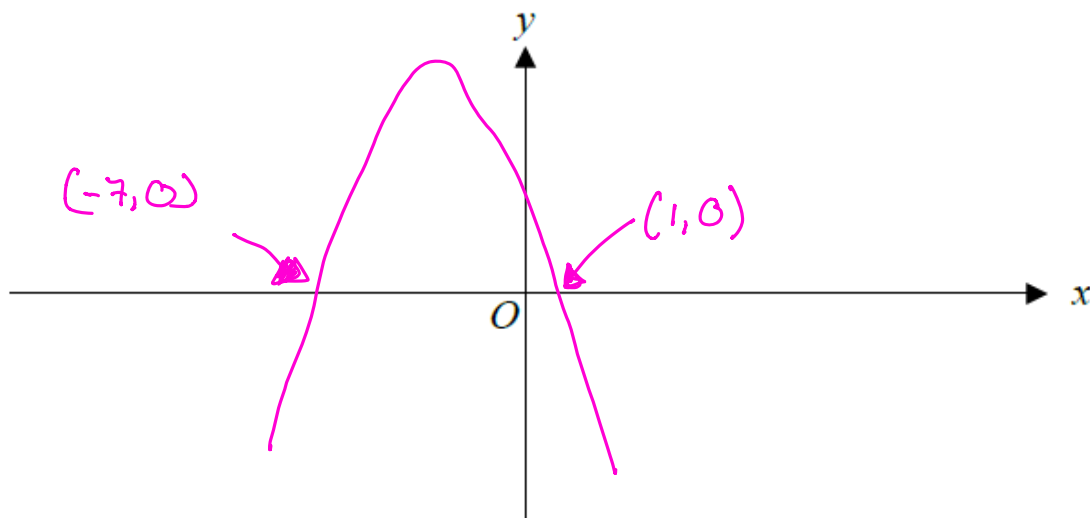
The graph passes through the points $(-2, 0)$ and $(6, 0)$.



← moves 5 units to the left

Sketch the graph of $y = f(x + 5)$ on the axes below.

You must indicate the coordinates of the points of intersection of the graph with the x-axis.

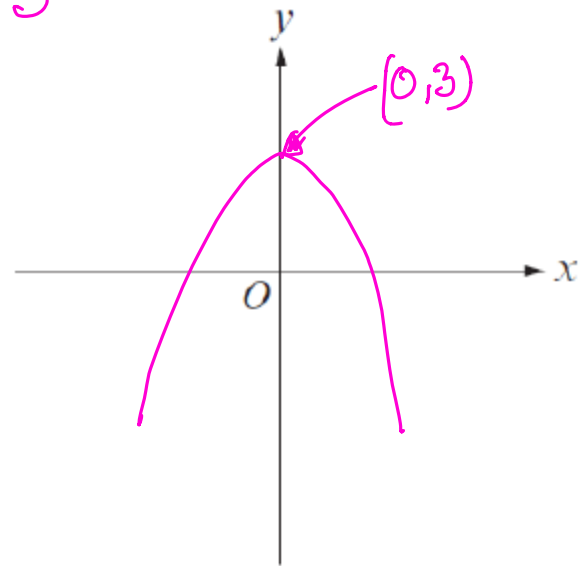
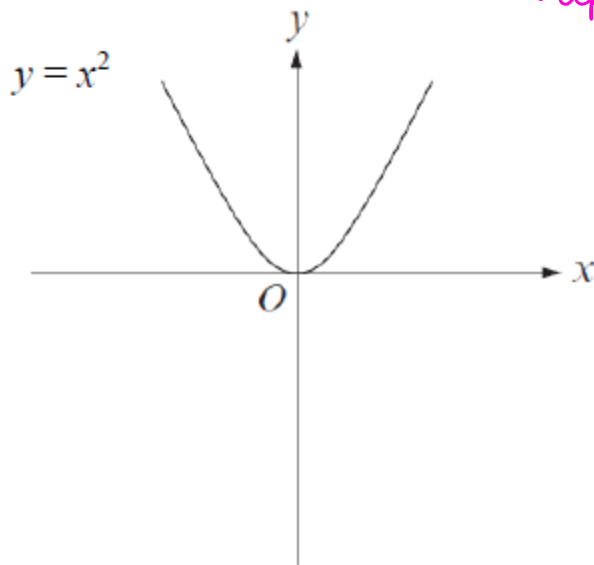


[3]

(b) The diagram below on the left shows a sketch of the graph $y = x^2$.

Sketch the graph of $y = -x^2 + 3$ on the axes on the right.

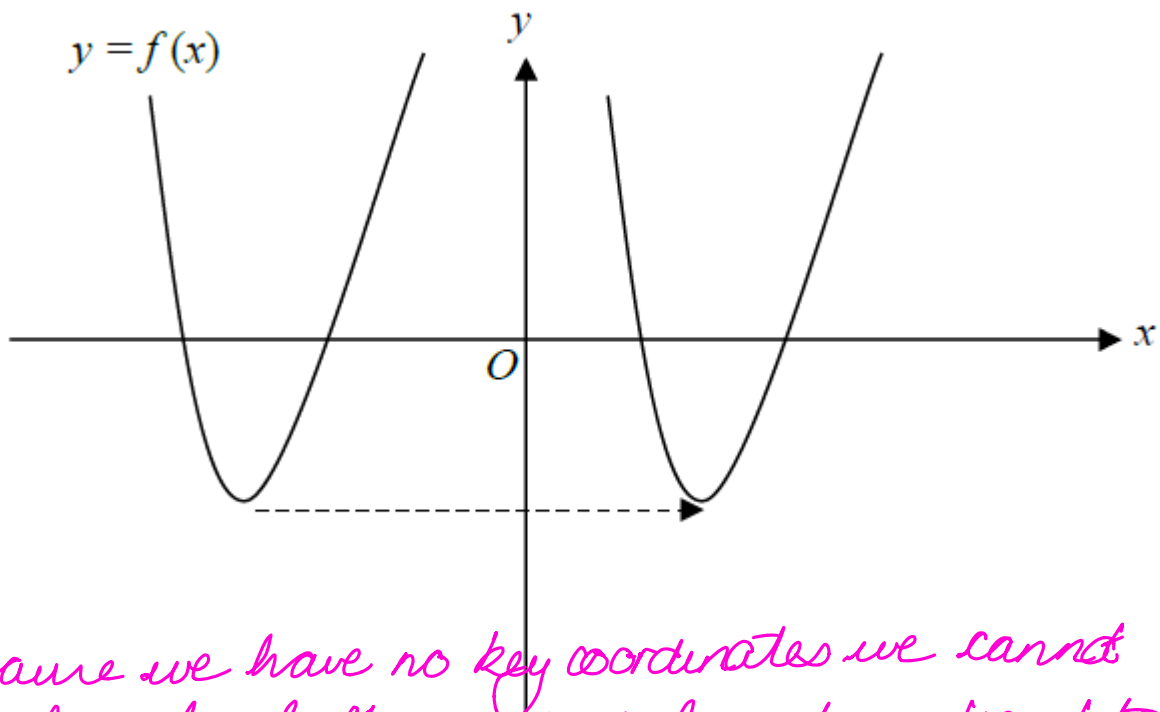
You must indicate the coordinates of the stationary point.



[2]

(c) The function $f(x)$ has been translated, as shown in the diagram below.

Explain why you cannot say exactly what translation was used.



because we have no key coordinates we cannot say how far to the right it has been translated.

[1]

2. The functions $f(x)$ and $g(x)$ are given by the following:

$$f(x) = 2x$$

$$g(x) = 3 + 2x$$

(a) Calculate the value of $gf(4)$

either

$$f(4) = 2 \times 4 = 8$$

$$g(8) = 3 + 2 \times 8 = 19$$

$$gf(x) = 3 + 2(2x) = 3 + 4x$$

$$gf(4) = 3 + 4 \times 4 = 19$$

[2]

(b) Solve the equation $fg(x) = 14$

$$fg(x) = 2(3 + 2x) = 6 + 4x$$

$$fg(x) = 14 = 6 + 4x$$

$$8 = 4x \quad \therefore x = 2$$

[4]

3. $f(x) = 3x$

Circle the expression for $f^{-1}(x)$

$$-3x$$

$$\frac{3}{x}$$

$$\frac{1}{3x}$$

$$\frac{x}{3}$$

[1]

4. $f(x) = 2x + c$

$$g(x) = cx + 5$$

$$fg(x) = 6x + d$$

c and d are constants.

Work out the value of d .

$$fg(x) = 2(cx + 5) + c$$

$$= 2cx + 10 + c$$

$$if \quad fg(x) = 6x + d$$

$$= 2cx + 10 + c$$

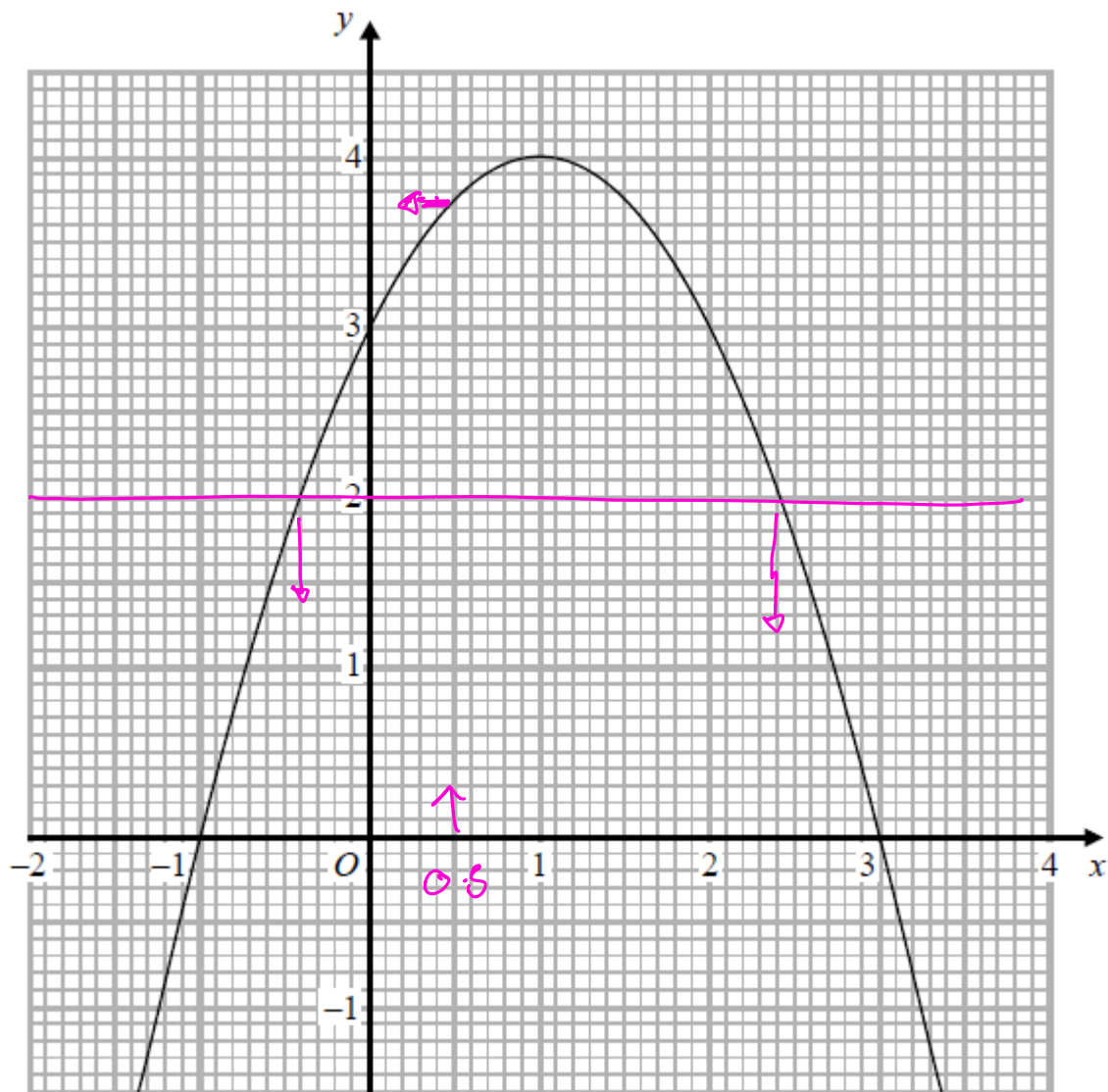
$$6x = 2cx \quad \text{and} \quad d = 10 + c$$

$$6 = 2c \quad \quad \quad = 10 + 3$$

$$\therefore c = 3 \quad \quad \quad d = 13$$

[3]

5. The graph of $y = f(x)$ is drawn on the grid.



(a) Write down the coordinates of the turning point of the graph.

(.....1.....,4.....) [1]

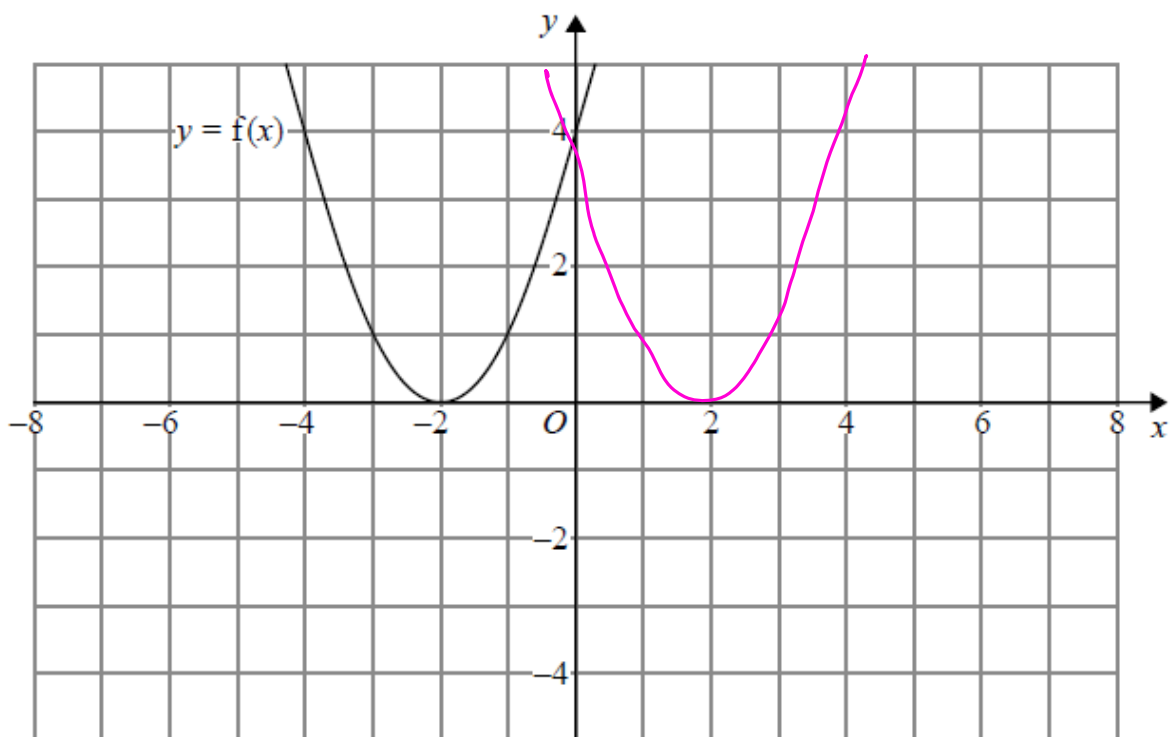
(b) Write down the roots of $f(x) = 2$

.....-0.4 and 2.4..... [1]

(c) Write down the value of $f(0.5)$

$f(0.5) = 3.75$ [1]

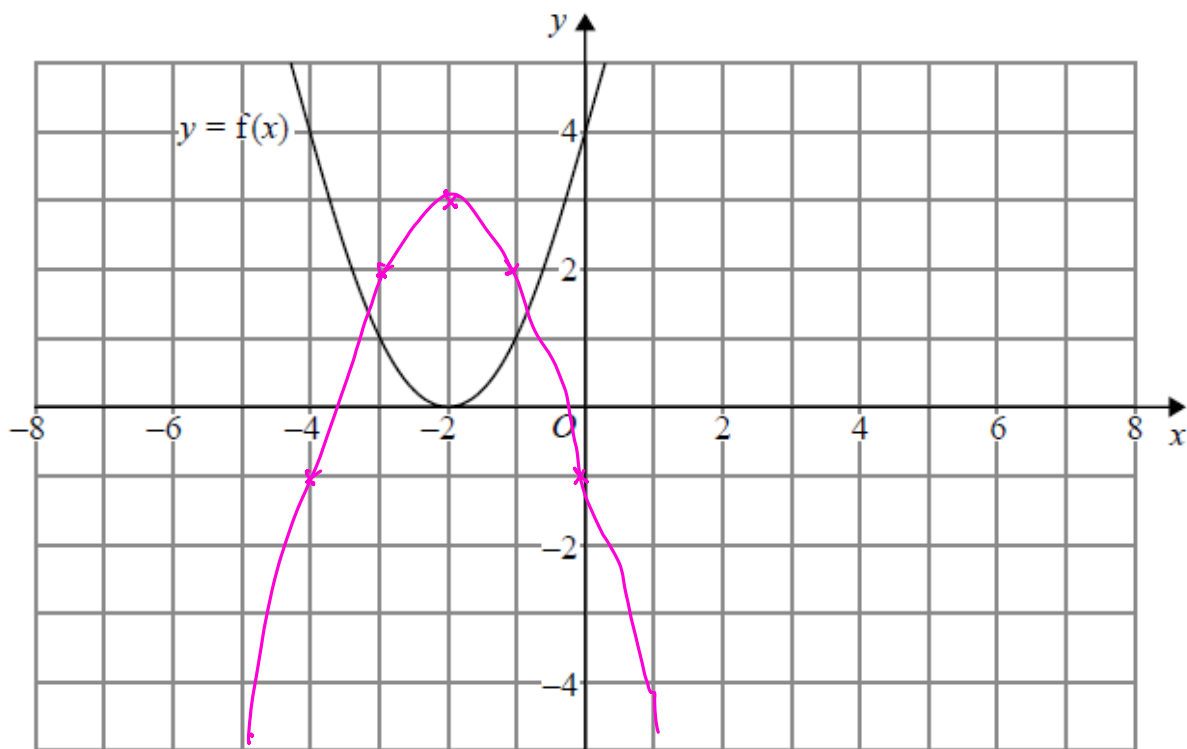
6. The graph of $y = f(x)$ is shown on both grids below.



(a) On the grid above, sketch the graph of $y = f(-x)$

reflection in y axis

[1]



reflect in x axis

(b) On this grid, sketch the graph of $y = -f(x) + 3$

translation $\begin{pmatrix} 0 \\ 3 \end{pmatrix}$

[2]

7. The function f is such that

(a) Find $f^{-1}(x)$

$$f(x) = 4x - 1$$

$y = 4x - 1$ (make x the subject)

$$y + 1 = 4x$$

$$x = \frac{y+1}{4}$$

$$f^{-1}(x) = \frac{x+1}{4} \dots\dots\dots [2]$$

The function g is such that

$$g(x) = kx^2 \text{ where } k \text{ is a constant.}$$

Given that $fg(2) = 12$

(b) work out the value of k

$$fg(x) = 4(kx^2) - 1$$

$$= 4kx^2 - 1$$

$$fg(2) = 12$$

$$4k(2)^2 - 1 = 12 \quad 16k = 13$$

$$k = \frac{13}{16} \dots\dots\dots [2]$$

8. The curve with equation $y = x^2 - 5x + 2$ is reflected in the x -axis.

Circle the equation of the reflected curve.



$$y = x^2 - 5x - 2$$

$$y = -x^2 + 5x - 2$$

$$y = -x^2 + 5x + 2$$

$$y = x^2 + 5x + 2$$

[1]

9. The functions f and g are such that

$$f(x) = 3(x - 4) \text{ and } g(x) = \frac{x}{5} + 1$$

a) Find the value of $f(10)$

$$f(10) = 3(10 - 4)$$

$$= 3 \times 6$$

$$\dots\dots\dots 18 \dots\dots\dots [1]$$

b) Find $g^{-1}(x)$

$$y = \frac{x}{5} + 1$$

$$y - 1 = \frac{x}{5} \quad x = 5(y - 1)$$

$$\dots\dots\dots g^{-1}(x) = 5(x - 1) \dots\dots\dots [2]$$

c) Show that $ff(x) = 9x - 48$

$$f(x) = 3x - 12$$

$$ff(x) = 3(3x - 12) - 12 = 9x - 36 - 12$$

$$= 9x - 48$$

[2]

Reflection in x axis

10. The graph of $y = f(x)$ is transformed to give the graph of $y = -f(x + 3)$

The point A on the graph of $y = f(x)$ is mapped to the point P on the graph of $y = -f(x + 3)$

The coordinates of point A are (9, 1)

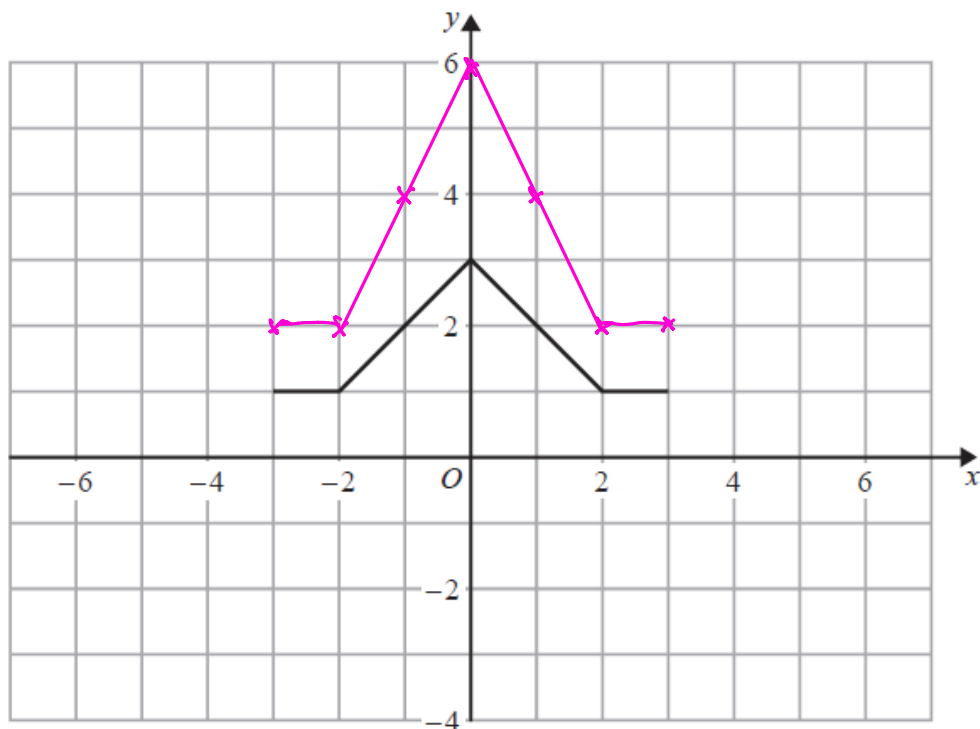
Find the coordinates of point P.

move 3 units
left.

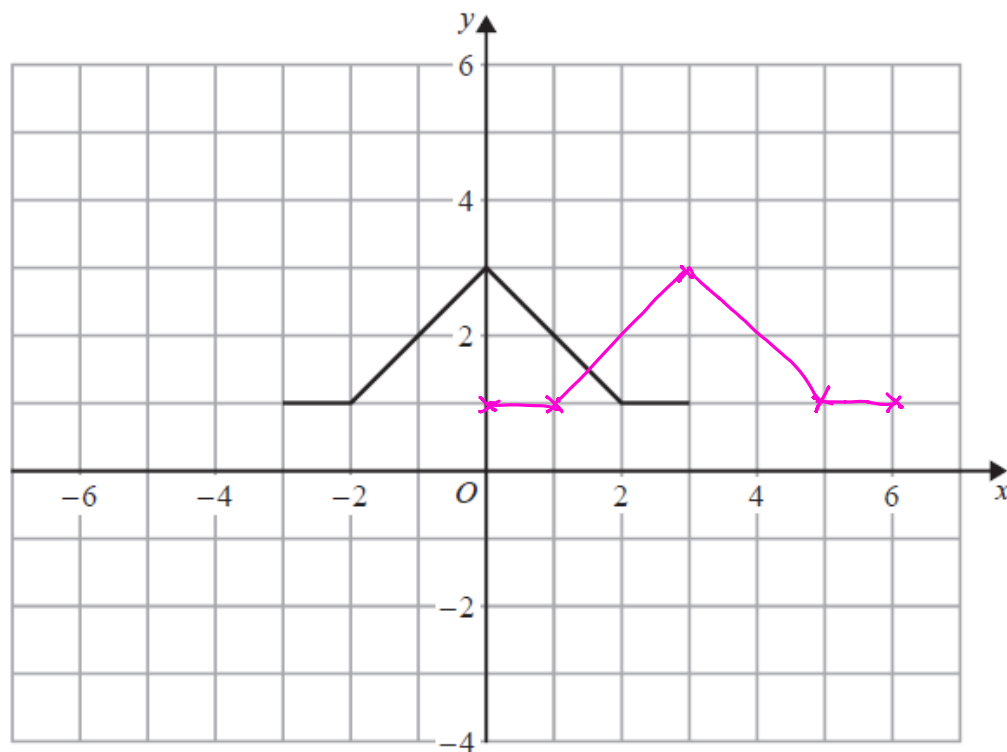
(.....6.....,-1.....) [2]

11 The graph of $y = f(x)$ is shown on both grids below.

i) On this grid, draw the graph of $y = 2f(x)$



ii) On the grid below, draw the graph of $y = f(x - 3)$



[2]

12. $f(x) = 3x^2 - 2x - 8$

Express $f(x + 2)$ in the form $ax^2 + bx$

$$\begin{aligned} f(x) &= 3(x+2)^2 - 2(x+2) - 8 \\ &= 3(x^2 + 4x + 4) - 2x - 4 - 8 \\ &= 3x^2 + 12x + 12 - 2x - 12 \\ &= 3x^2 + 10x \end{aligned}$$

[3]

13. For all values of x , $f(x) = x^2 + 1$ $g(x) = x - 5$

a) Show that $fg(x) = x^2 - 10x + 26$

$$\begin{aligned} fg(x) &= (x-5)^2 + 1 \\ &= x^2 - 10x + 25 + 1 \\ &= x^2 - 10x + 26 \end{aligned}$$

[2]

b) Solve $fg(x) = gf(x)$

$$\begin{aligned} gf(x) &= (x^2 + 1) - 5 \\ &= x^2 - 4 \end{aligned}$$

$$fg(x) = gf(x)$$

$$x^2 - 10x + 26 = x^2 - 4$$

$$-10x + 26 = -4$$

$$-10x = -30 \quad \underline{x = 3}$$

[4]

14. The graph with equation $y = x^2$ is translated by vector $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$ \rightarrow left 2
sof $(x-2)$
- Circle the equation of the translated graph.

[1]

$y = (x - 2)^2$

$y = (x + 2)^2$

$y = x^2 + 4$

$y = x^2 + 2$

15. For all values of x , $f(x) = \frac{4x-3}{5}$

Work out $f^{-1}(x)$

$y = \frac{4x-3}{5}$

$5y = 4x - 3$

$5y + 3 = 4x$

$x = \frac{5y+3}{4}$

[3]

$f^{-1}(x) = \frac{5y+3}{4}$

CREDITS AND NOTES

Question	Awarding Body	Question	Awarding Body
1	WJEC Eduqas	14	AQA
2	WJEC Eduqas	15	AQA
3	AQA		
4	AQA		
5	Pearson Edexcel		
6	Pearson Edexcel		
7	Pearson Edexcel		
8	AQA		
9	Pearson Edexcel		
10	Pearson Edexcel		
11	Pearson Edexcel		
12	Pearson Edexcel		
13	AQA		

Notes:

These questions have been retyped from the original sample/specimen assessment materials and whilst every effort has been made to ensure there are no errors, any that do appear are mine and not the exam board's (similarly any errors I have corrected from the originals are also my corrections and not theirs!).

Please also note that the layout in terms of fonts, answer lines and space given to each question does not reflect the actual papers to save space.

These questions have been collated by me as the basis for a GCSE working party set up by the GLOW maths hub - if you want to get involved please get in touch. The objective is to provide support to fellow teachers and to give you a flavour of how different topics "could" be examined. They should not be used to form a decision as to which board to use. There is no guarantee that a topic will or won't appear in the "live" papers from a specific exam board or that examination of a topic will be as shown in these questions.

Links:

AQA <http://www.aqa.org.uk/subjects/mathematics/gcse/mathematics-8300>

OCR <http://ocr.org.uk/gcsemaths>

Pearson Edexcel <http://qualifications.pearson.com/en/qualifications/edexcel-gcses/mathematics-2015.html>

WJEC Eduqas <http://www.eduqas.co.uk/qualifications/mathematics/gcse/>

Contents:

This version contains questions from:

AQA – Sample Assessment Material, Practice set 1 and Practice set 2

OCR – Sample Assessment Material and Practice set 1

Pearson Edexcel – Sample Assessment Material, Specimen set 1 and Specimen set 2

WJEC Eduqas – Sample Assessment Material

