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**AS Mathematics Exam Questions by Topic**  
**Chapter 8: Graphs and Transformations**

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These questions are taken from the Specimen Exam materials and the real 2018 papers for the new syllabus AS and A-level mathematics courses and arranged by chapter of the textbooks by Goldie et al (available here: <https://amzn.to/39umfr5> and <https://amzn.to/3hE8kBL> ). There are a mixture of questions from OCR A, OCR B (MEI), Edexcel and AQA. Although the style of questions varies a little across the exam boards the content of the syllabus is almost identical so these are suitable for students preparing for any exam board.

Free problem sets for all other chapters, as well as video solutions, full past papers and other content for GCSE and A-level maths can be found at:

<https://mathsaurus.com/>

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OCR A AS 2018 Paper 2 Question 2:

- 2 (i) The curve  $y = \frac{2}{3+x}$  is translated by four units in the positive  $x$ -direction. State the equation of the curve after it has been translated. [2]
- (ii) Describe fully the single transformation that transforms the curve  $y = \frac{2}{3+x}$  to  $y = \frac{5}{3+x}$ . [2]
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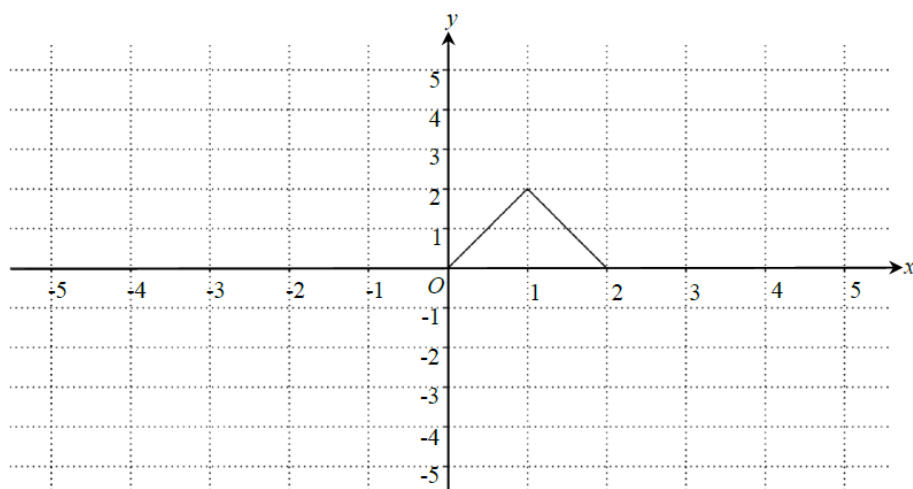
OCR B MEI 2018 Paper 3 Question 2:

- 2 The curve  $y = x^3 - 2x$  is translated by the vector  $\begin{pmatrix} 1 \\ -4 \end{pmatrix}$ . Write down the equation of the translated curve. [2]
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OCR A AS Sample Paper 2 Question 1:

- 1 (i) The diagram below shows the graph of  $y = f(x)$ .



- (a) On the diagram in the Printed Answer Booklet draw the graph of  $y = f(x+3)$ . [2]
- (b) Describe fully the transformation which transforms the graph of  $y = f(x)$  to the graph of  $y = -f(x)$ . [1]
- (ii) The point  $(2, 3)$  lies on the graph of  $y = g(x)$ . State the coordinates of its image when  $y = g(x)$  is transformed to
- (a)  $y = 4g(x)$ , [1]
- (b)  $y = g(4x)$ . [1]

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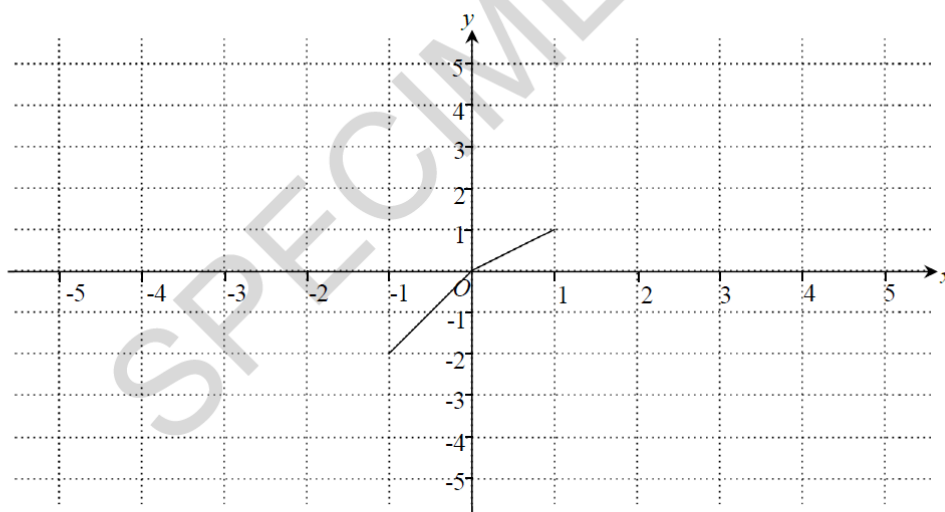
OCR B MEI Sample Paper 2 Question 2:

- 2 Given that  $f(x) = x^3$  and  $g(x) = 2x^3 - 1$ , describe a sequence of two transformations which maps the curve  $y = f(x)$  onto the curve  $y = g(x)$ . [4]
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OCR A Sample Paper 1 Question 3:

- 3 The diagram below shows the graph of  $y = f(x)$ .



- (i) On the diagram in your Printed Answer Booklet, draw the graph of  $y = f\left(\frac{1}{2}x\right)$ . [1]
- (ii) On the diagram in your Printed Answer Booklet, draw the graph of  $y = f(x-2) + 1$ . [2]
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OCR B MEI AS 2018 Paper 1 Question 9:

- 9 The curve  $y = (x-1)^2$  maps onto the curve  $C_1$  following a stretch scale factor  $\frac{1}{2}$  in the  $x$ -direction.
- (i) Show that the equation of  $C_1$  can be written as  $y = 4x^2 - 4x + 1$ . [2]
- The curve  $C_2$  is a translation of  $y = 4.25x - x^2$  by  $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$ .
- (ii) Show that the normal to the curve  $C_1$  at the point  $(0, 1)$  is a tangent to the curve  $C_2$ . [7]
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OCR B MEI AS Sample Paper 1 Question 10:

- 10 (i) Sketch the graph of  $y = \frac{1}{x} + a$ , where  $a$  is a positive constant.
- State the equations of the horizontal and vertical asymptotes.
  - Give the coordinates of any points where the graph crosses the axes. [4]
- (ii) Find the equation of the normal to the curve  $y = \frac{1}{x} + 2$  at the point where  $x = 2$ . [5]
- (iii) Find the coordinates of the point where this normal meets the curve again. [3]
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AQA 2018 Paper 1 Question 2:

- 2 The graph of  $y = 5^x$  is transformed by a stretch in the  $y$ -direction, scale factor 5
- State the equation of the transformed graph.

Circle your answer.

[1 mark]

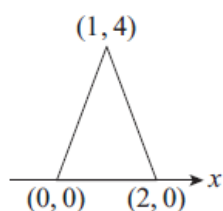
$y = 5 \times 5^x$        $y = 5^{\frac{x}{5}}$        $y = \frac{1}{5} \times 5^x$        $y = 5^{5x}$

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AQA AS 2018 Paper 2 Question 2:

- 2 Figure 1 shows  $y = f(x)$ .

Figure 1



Which figure below shows  $y = f(2x)$ ?

Tick one box.

[1 mark]

Figure 2

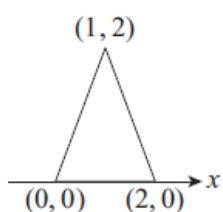


Figure 3

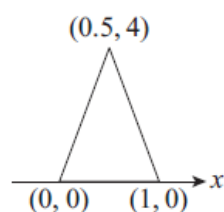


Figure 4

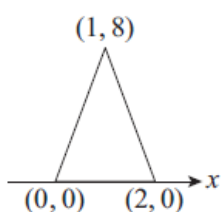


Figure 5

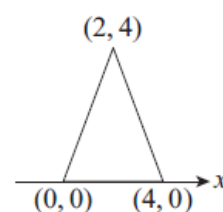


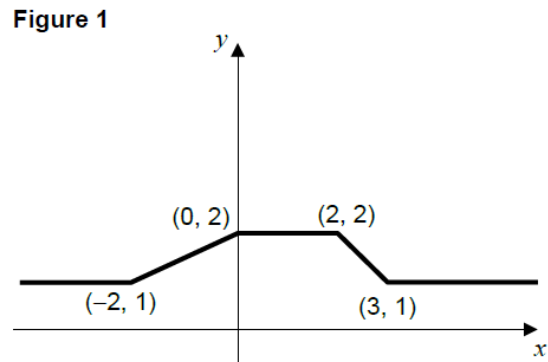
Figure 2

Figure 3

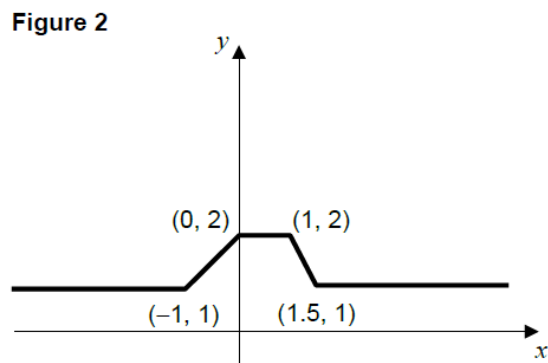
Figure 4

Figure 5

2 The graph of  $y = f(x)$  is shown in **Figure 1**.



State the equation of the graph shown in **Figure 2**.



Circle your answer.

[1 mark]

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

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Edexcel AS Sample Paper 1 Question 13:

13. (a) Factorise completely  $x^3 + 10x^2 + 25x$  (2)

- (b) Sketch the curve with equation

$$y = x^3 + 10x^2 + 25x$$

showing the coordinates of the points at which the curve cuts or touches the  $x$ -axis. (2)

The point with coordinates  $(-3, 0)$  lies on the curve with equation

$$y = (x + a)^3 + 10(x + a)^2 + 25(x + a)$$

where  $a$  is a constant.

- (c) Find the two possible values of  $a$ . (3)

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OCR A AS 2018 Paper 1 Question 6:

- 6 Sketch the following curves.

(i)  $y = \frac{2}{x}$  [2]

(ii)  $y = x^3 - 6x^2 + 9x$  [5]

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AQA AS Sample Paper 1 Question 1:

- 1 The curve  $y = \sqrt{x}$  is translated onto the curve  $y = \sqrt{x + 4}$

The translation is described by a vector.

Find this vector.

Circle your answer.

[1 mark]

$$\begin{bmatrix} 4 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} -4 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 0 \\ 4 \end{bmatrix}$$

$$\begin{bmatrix} 0 \\ -4 \end{bmatrix}$$