



AS Mathematics Exam Questions by Topic
Chapter 7: Polynomials

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/>

OCR B MEI AS 2018 Paper 1 Question 6:

6 In this question you must show detailed reasoning.

You are given that $f(x) = 4x^3 - 3x + 1$.

(i) Use the factor theorem to show that $(x + 1)$ is a factor of $f(x)$. [2]

(ii) Solve the equation $f(x) = 0$. [3]

AQA AS Sample Paper 2 Question 1:

1 $p(x) = x^3 - 5x^2 + 3x + a$, where a is a constant.

Given that $x - 3$ is a factor of $p(x)$, find the value of a

Circle your answer.

[1 mark]

-9 -3 3 9

AQA Sample Paper 1 Question 4:

4 $p(x) = 2x^3 + 7x^2 + 2x - 3$

4 (a) Use the factor theorem to prove that $x + 3$ is a factor of $p(x)$

[2 marks]

4 (b) Simplify the expression $\frac{2x^3 + 7x^2 + 2x - 3}{4x^2 - 1}$, $x \neq \pm \frac{1}{2}$

[4 marks]

Edexcel 2018 Paper 2 Question 6:

6.

$$f(x) = -3x^3 + 8x^2 - 9x + 10, \quad x \in \mathbb{R}$$

(a) (i) Calculate $f(2)$

(ii) Write $f(x)$ as a product of two algebraic factors.

(3)

Using the answer to (a)(ii),

(b) prove that there are exactly two real solutions to the equation

$$-3y^6 + 8y^4 - 9y^2 + 10 = 0$$

(2)

(c) deduce the number of real solutions, for $7\pi \leq \theta < 10\pi$, to the equation

$$3 \tan^3 \theta - 8 \tan^2 \theta + 9 \tan \theta - 10 = 0$$

(1)

Edexcel AS 2018 Paper 1 Question 9:

9.

$$g(x) = 4x^3 - 12x^2 - 15x + 50$$

(a) Use the factor theorem to show that $(x + 2)$ is a factor of $g(x)$. (2)

(b) Hence show that $g(x)$ can be written in the form $g(x) = (x + 2)(ax + b)^2$,
where a and b are integers to be found. (4)

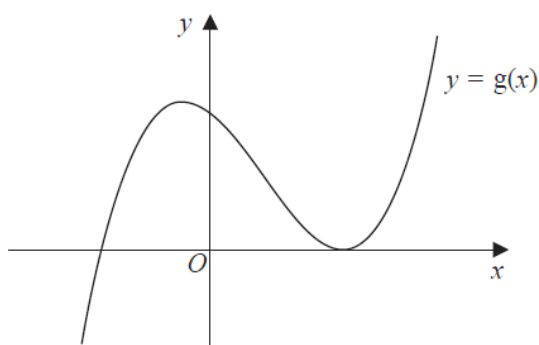


Figure 2

Figure 2 shows a sketch of part of the curve with equation $y = g(x)$

(c) Use your answer to part (b), and the sketch, to deduce the values of x for which

(i) $g(x) \leq 0$

(ii) $g(2x) = 0$ (3)

Edexcel AS Sample Paper 1 Question 4:

4.

$$f(x) = 4x^3 - 12x^2 + 2x - 6$$

(a) Use the factor theorem to show that $(x - 3)$ is a factor of $f(x)$. (2)

(b) Hence show that 3 is the only real root of the equation $f(x) = 0$ (4)

Edexcel Sample Paper 2 Question 1:

1.

$$f(x) = 2x^3 - 5x^2 + ax + a$$

Given that $(x + 2)$ is a factor of $f(x)$, find the value of the constant a .

[3]

OCR A 2018 Paper 1 Question 6:

6 The cubic polynomial $f(x)$ is defined by $f(x) = 2x^3 - 7x^2 + 2x + 3$.

(i) Given that $(x - 3)$ is a factor of $f(x)$, express $f(x)$ in a fully factorised form. [3]

(ii) Sketch the graph of $y = f(x)$, indicating the coordinates of any points of intersection with the axes. [2]

(iii) Solve the inequality $f(x) < 0$, giving your answer in set notation. [2]

(iv) The graph of $y = f(x)$ is transformed by a stretch parallel to the x -axis, scale factor $\frac{1}{2}$. Find the equation of the transformed graph. [2]

OCR B MEI 2018 Paper 1 Question 1:

1 Show that $(x - 2)$ is a factor of $3x^3 - 8x^2 + 3x + 2$. [3]

OCR A AS Sample Paper 1 Question 6:

6 **In this question you must show detailed reasoning.**

The cubic polynomial $f(x)$ is defined by $f(x) = 4x^3 + 4x^2 + 7x - 5$.

(i) Show that $(2x - 1)$ is a factor of $f(x)$. [2]

(ii) Hence solve the equation $4\sin^3 \theta + 4\sin^2 \theta + 7\sin \theta - 5 = 0$ for $0^\circ \leq \theta \leq 360^\circ$. [7]