Higher Mathematics

Polynomials - **Questions** - 2013-2019

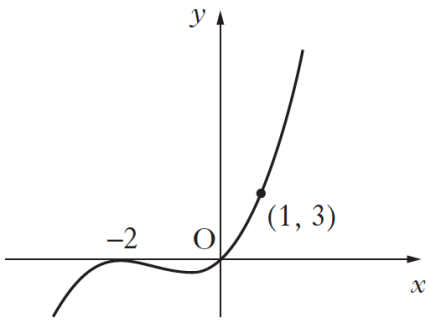
Marks are indicated in brackets after each question number

2013 Paper 1 Question 6, (2)

What is the remainder when $x^3 + 3x^2 - 5x - 6$ is divided by $(x - 2)$?

2013 Paper 1 Question 17, (2)

The diagram shows a curve with equation of the form $y = kx(x + a)^2$, which passes through the points $(-2, 0)$, $(0, 0)$ and $(1, 3)$.



What are the values of a and k?

2013 Paper 2 Question 3, (4) (5)

(*a*) Given that $(x - 1)$ is a factor of $x^3 + 3x^2 + x - 5$, factorise this cubic fully.

(*b*) Show that the curve with equation

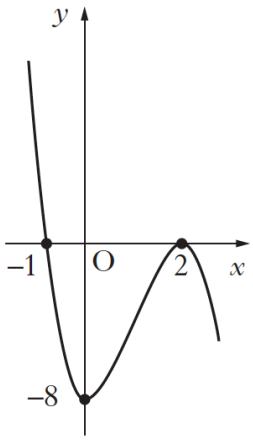
$$y = x^4 + 4x^3 + 2x^2 - 20x + 3$$

has only one stationary point.

Find the x-coordinate and determine the nature of this point.

2014 Paper 1 Question 15, (2)

The diagram shows a cubic curve passing through (–1, 0), (2, 0) and (0, –8).



What is the equation of the curve?

2014 Paper 1 Question 22, (4) (3)

For the polynomial $6x^3 + 7x^2 + ax + b$,

- $x + 1$ is a factor
- 72 is the remainder when it is divided by $x - 2$.

(*a*) Determine the values of a and b.

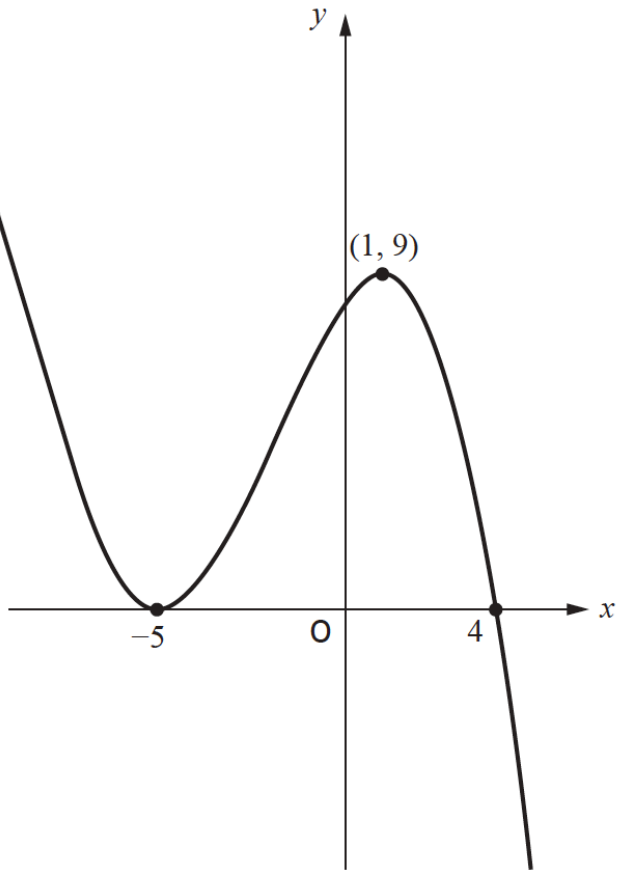
(*b*) Hence factorise the polynomial completely.

2015 Paper 1 Question 3, (4)

Show that $(x + 3)$ is a factor of $x^3 - 3x^2 - 10x + 24$ and hence factorise $x^3 - 3x^2 - 10x + 24$ fully.

2016 Paper 1 Question 15, (3) (1)

The diagram below shows the graph with equation $y = f(x)$, where $f(x) = k(x-a)(x-b)^2$.



(a) Find the values of a, b and k.

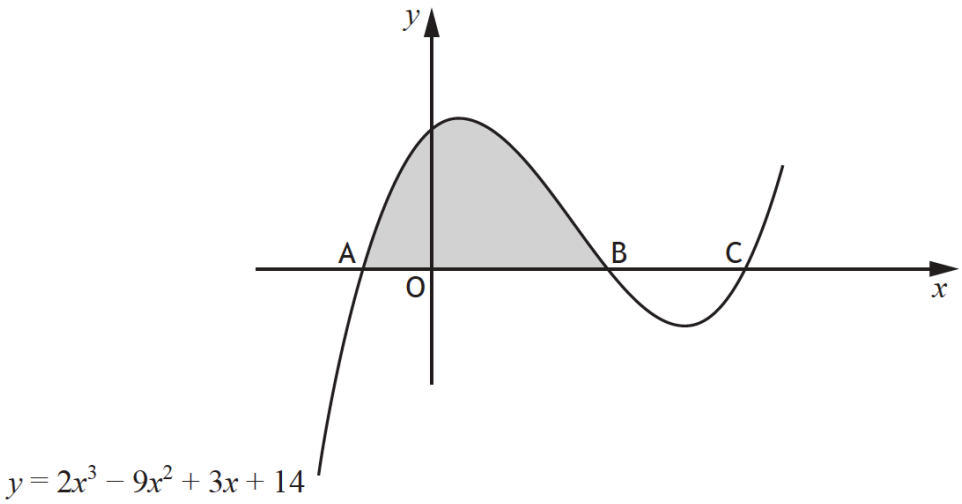
(b) For the function $g(x) = f(x) - d$, where d is positive, determine the range of values of d for which $g(x)$ has exactly one real root.

2016 Paper 2 Question 3, (2) (3) (1) (4)

(a) (i) Show that $(x+1)$ is a factor of $2x^3 - 9x^2 + 3x + 14$.

(ii) Hence solve the equation $2x^3 - 9x^2 + 3x + 14 = 0$.

(b) The diagram below shows the graph with equation $y = 2x^3 - 9x^2 + 3x + 14$.
The curve cuts the x-axis at A, B and C.



(i) Write down the coordinates of the points A and B.

(ii) Hence calculate the shaded area in the diagram.

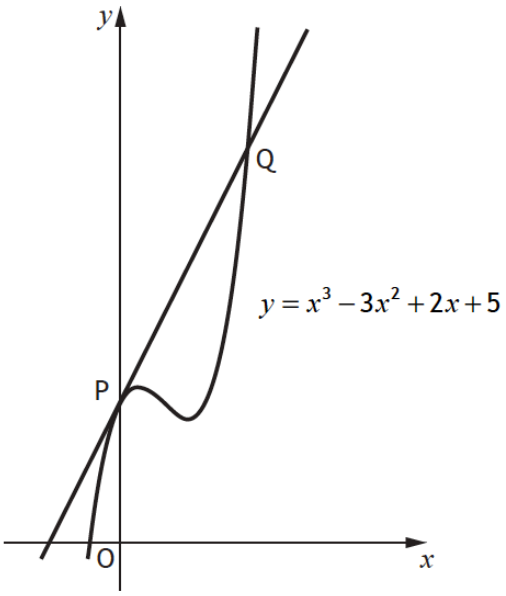
2017 Paper 2 Question 2, (2) (3)

(a) Show that $(x-1)$ is a factor of $f(x) = 2x^3 - 5x^2 + x + 2$.

(b) Hence, or otherwise, solve $f(x) = 0$.

2018 Paper 1 Question 7, (1) (3) (4)

The curve with equation $y = x^3 - 3x^2 + 2x + 5$ is shown on the diagram.



(a) Write down the coordinates of P, the point where the curve crosses the y-axis .

(b) Determine the equation of the tangent to the curve at P.

(c) Find the coordinates of Q, the point where this tangent meets the curve again.

2018 Paper 1 Question 15, (5)

A cubic function, f, is defined on the set of real numbers.

- $(x+4)$ is a factor of $f(x)$
- $x = 2$ is a repeated root of $f(x)$
- $f'(-2) = 0$
- $f'(x) > 0$ where the graph with equation $y = f(x)$ crosses the y-axis

Sketch a possible graph of $y = f(x)$ on the diagram in your answer booklet.

2018 Paper 2 Question 7, (2) (2)

(a) (i) Show that $(x-2)$ is a factor of $2x^3-3x^2-3x+2$.

(ii) Hence, factorise $2x^3-3x^2-3x+2$ fully.

2019 Paper 2 Question 10, (2)

(a) Show that $(x+3)$ is a factor of $3x^4+10x^3+x^2-8x-6$.

(b) Hence, or otherwise, factorise $3x^4+10x^3+x^2-8x-6$ fully.