

## Higher Mathematics

### Polynomials - Questions - 2013-2017

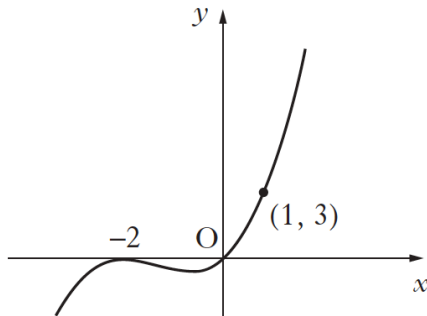
Marks are indicated in brackets after each question number

#### 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

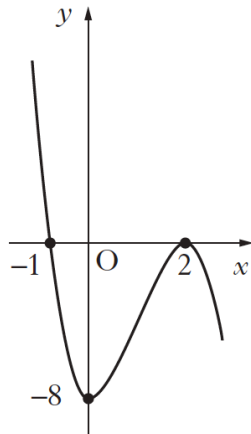
$$y = x^4 + 4x^3 + 2x^2 - 20x + 3$$

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  $b$ .

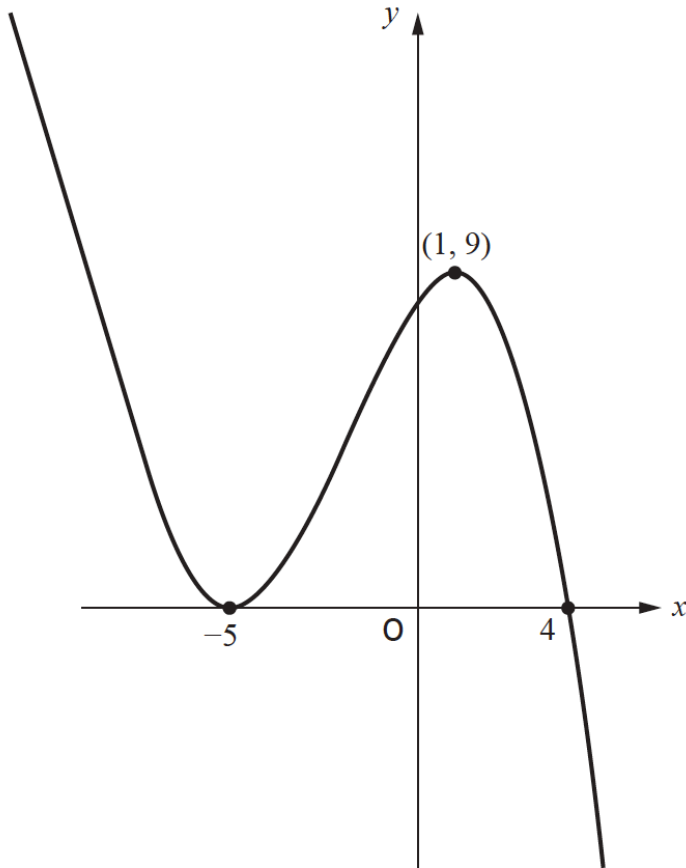
(b) Hence factorise the polynomial completely.

### 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)

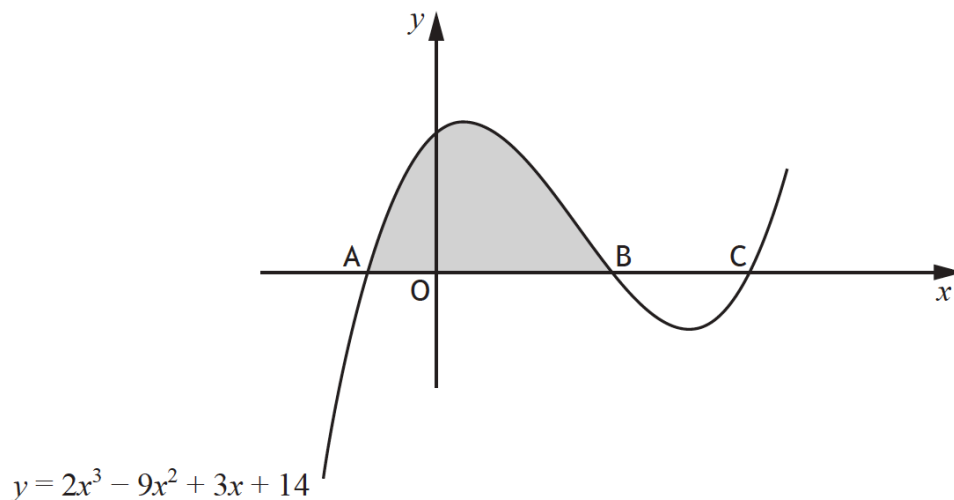
The diagram below shows the graph with equation  $y = f(x)$ , where  $f(x) = k(x-a)(x-b)^2$ .



- (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  $f(x) = 0$ .