

1  $f(x) \equiv x^3 - 5x^2 + ax + b.$

Given that  $(x + 2)$  and  $(x - 3)$  are factors of  $f(x)$ ,

- a show that  $a = -2$  and find the value of  $b$ .  
 b Hence, express  $f(x)$  as the product of three linear factors.

2  $f(x) \equiv 8x^3 - x^2 + 7.$

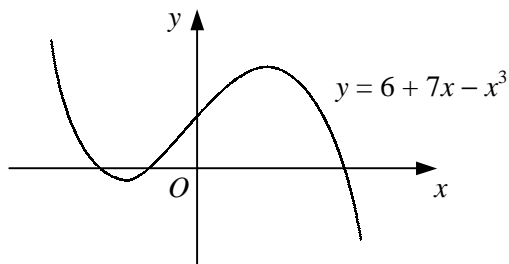
The remainder when  $f(x)$  is divided by  $(x - k)$  is eight times the remainder when  $f(x)$  is divided by  $(2x - k)$ .

Find the two possible values of the constant  $k$ .

3  $f(x) \equiv 3x^3 - x^2 - 12x + 4.$

- a Show that  $(x - 2)$  is a factor of  $f(x)$ .  
 b Solve the equation  $f(x) = 0$ .

4



The diagram shows the curve with the equation  $y = 6 + 7x - x^3$ .

Find the coordinates of the points where the curve crosses the  $x$ -axis.

5  $f(x) \equiv 3x^3 + px^2 + 8x + q.$

When  $f(x)$  is divided by  $(x + 1)$  there is a remainder of  $-4$ .

When  $f(x)$  is divided by  $(x - 2)$  there is a remainder of  $80$ .

- a Find the values of the constants  $p$  and  $q$ .  
 b Show that  $(x + 2)$  is a factor of  $f(x)$ .  
 c Solve the equation  $f(x) = 0$ .

6 a Solve the equation

$$x^3 - 4x^2 - 7x + 10 = 0.$$

b Hence, solve the equation

$$y^6 - 4y^4 - 7y^2 + 10 = 0.$$

7

$$f(n) \equiv n^3 + 7n^2 + 14n + 3.$$

- a Find the remainder when  $f(n)$  is divided by  $(n + 1)$ .  
 b Express  $f(n)$  in the form

$$f(n) \equiv (n + 1)(n + a)(n + b) + c,$$

where  $a$ ,  $b$  and  $c$  are integers.

- c Hence, show that  $f(n)$  is odd for all positive integer values of  $n$ .