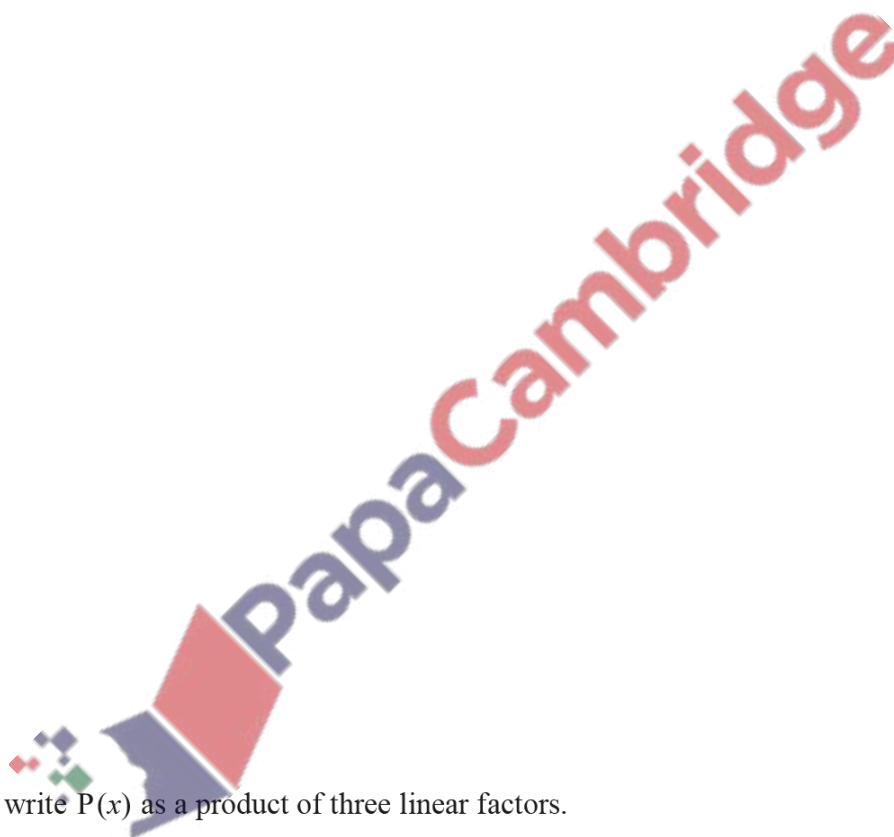


**1. Nov/2023/Paper\_0606/11/No.2**

The polynomial  $P(x)$  is such that  $P(x) = ax^3 - 11x^2 + bx + c$ , where  $a$ ,  $b$  and  $c$  are integers.  $P(x)$  is divisible by  $x$  and has a remainder of  $\frac{3}{2}$  when divided by  $2x + 1$ . It is also given that  $P'(2) = 18$ .

**(a)** Find the values of  $a$ ,  $b$  and  $c$ . [6]

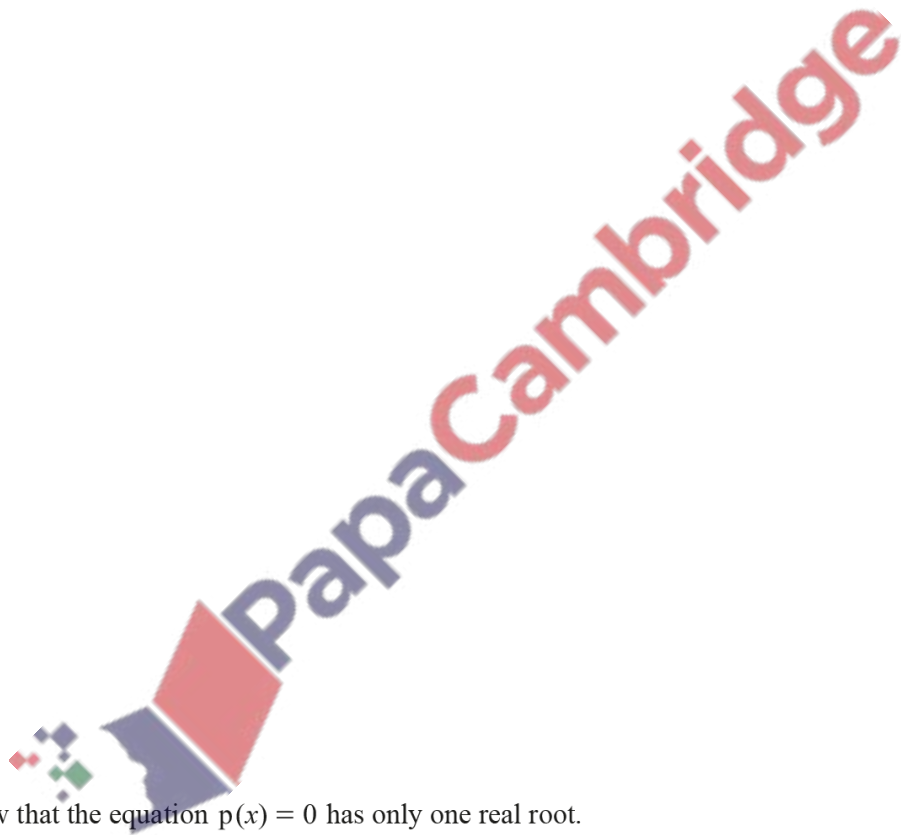


**(b)** Hence write  $P(x)$  as a product of three linear factors. [2]

2. Nov/2023/Paper\_0606/12/No.6

The polynomial  $p(x)$  is such that  $p(x) = ax^3 + bx^2 + cx - 5$ , where  $a$ ,  $b$  and  $c$  are integers. It is given that  $p'(0) = 12$ . It is also given that  $p(x)$  has a factor of  $3x - 1$  and a remainder of 95 when divided by  $x - 2$ .

- (a) Find the values of  $a$ ,  $b$  and  $c$ . [7]



- (b) Show that the equation  $p(x) = 0$  has only one real root. [3]

3. Nov/2023/Paper\_0606/13/No.4

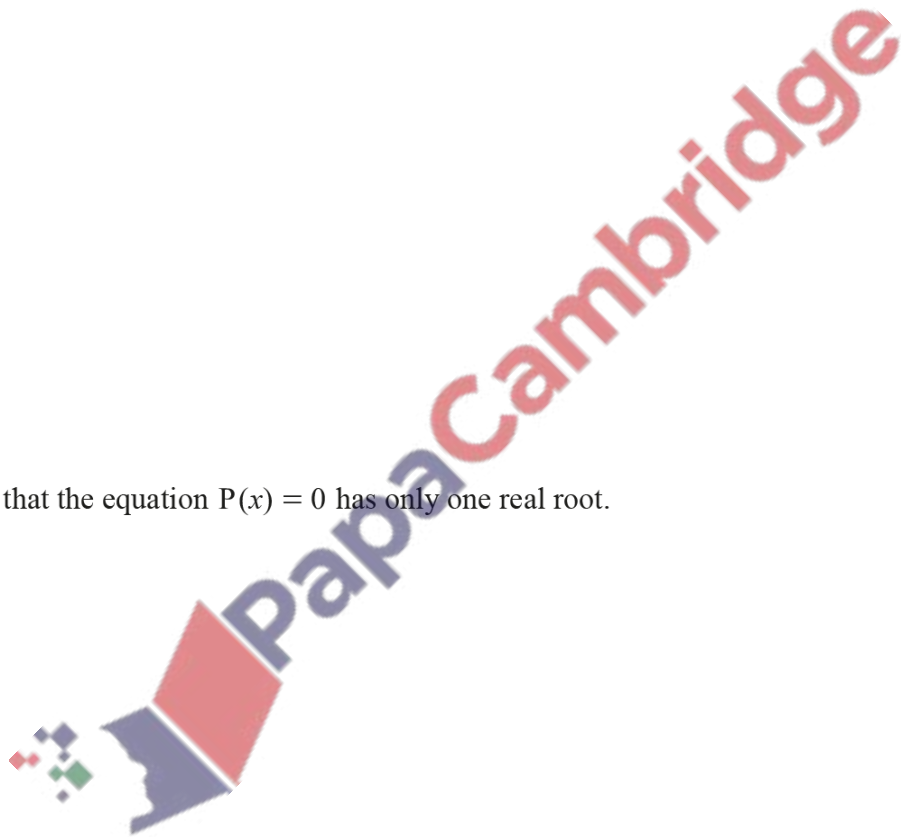
The polynomial  $P$  is given by  $P(x) = ax^3 + bx^2 + 3x + 2$ , where  $a$  and  $b$  are integers.  $P(x)$  has a factor of  $2x + 1$ .  $P(x)$  has a remainder of  $-6$  when divided by  $x + 1$ .

(a) Find the values of  $a$  and  $b$ .

[5]

(b) Show that the equation  $P(x) = 0$  has only one real root.

[3]

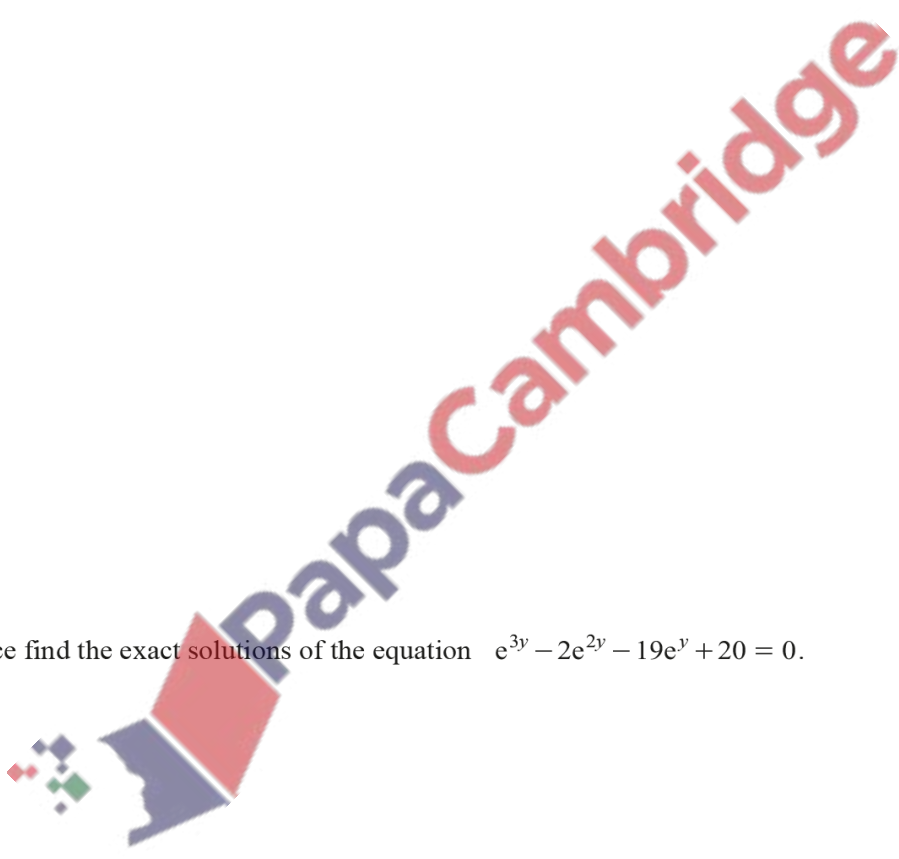


**DO NOT USE A CALCULATOR IN THIS QUESTION.**

(a) Show that  $x - 1$  is a factor of the expression  $x^3 - 2x^2 - 19x + 20$ . [1]

(b) Hence write  $x^3 - 2x^2 - 19x + 20$  as a product of its linear factors. [3]

(c) Hence find the exact solutions of the equation  $e^{3y} - 2e^{2y} - 19e^y + 20 = 0$ . [2]



5. June/2023/Paper\_0606/11/No.2

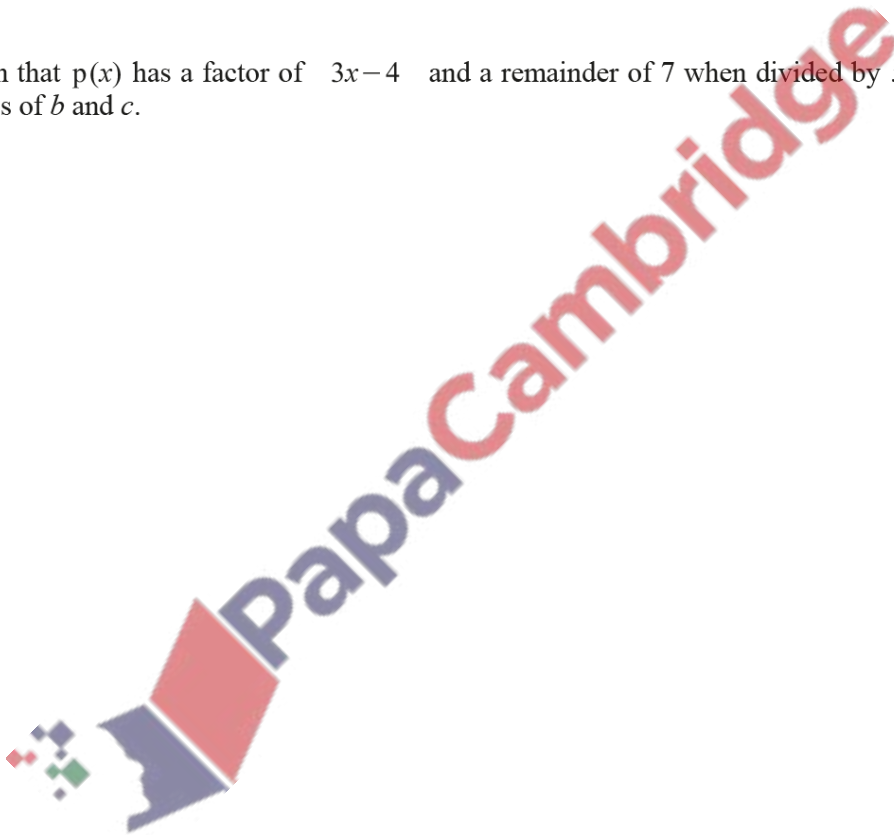
The polynomial  $p$  is such that  $p(x) = ax^3 + 7x^2 + bx + c$ , where  $a$ ,  $b$  and  $c$  are integers.

(a) Given that  $p''\left(\frac{1}{2}\right) = 32$ , show that  $a = 6$ .

[2]

(b) Given that  $p(x)$  has a factor of  $3x - 4$  and a remainder of 7 when divided by  $x + 1$ , find the values of  $b$  and  $c$ .

[4]

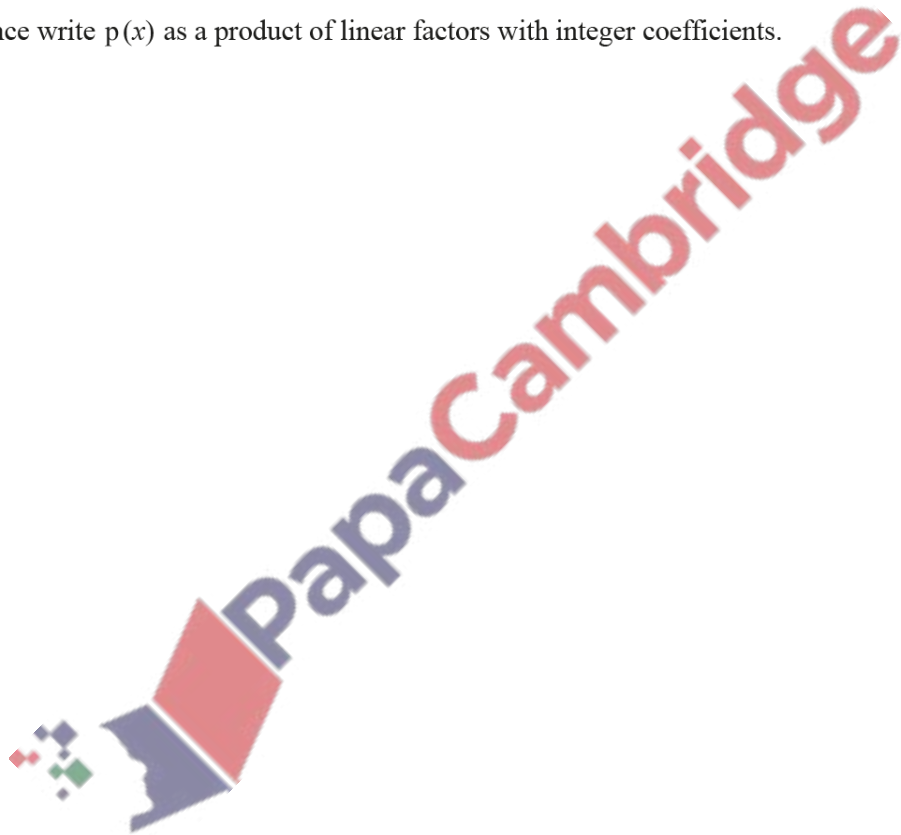


(c) Write  $p(x)$  in the form  $(3x - 4)q(x)$ , where  $q(x)$  is a quadratic factor.

[2]

(d) Hence write  $p(x)$  as a product of linear factors with integer coefficients.

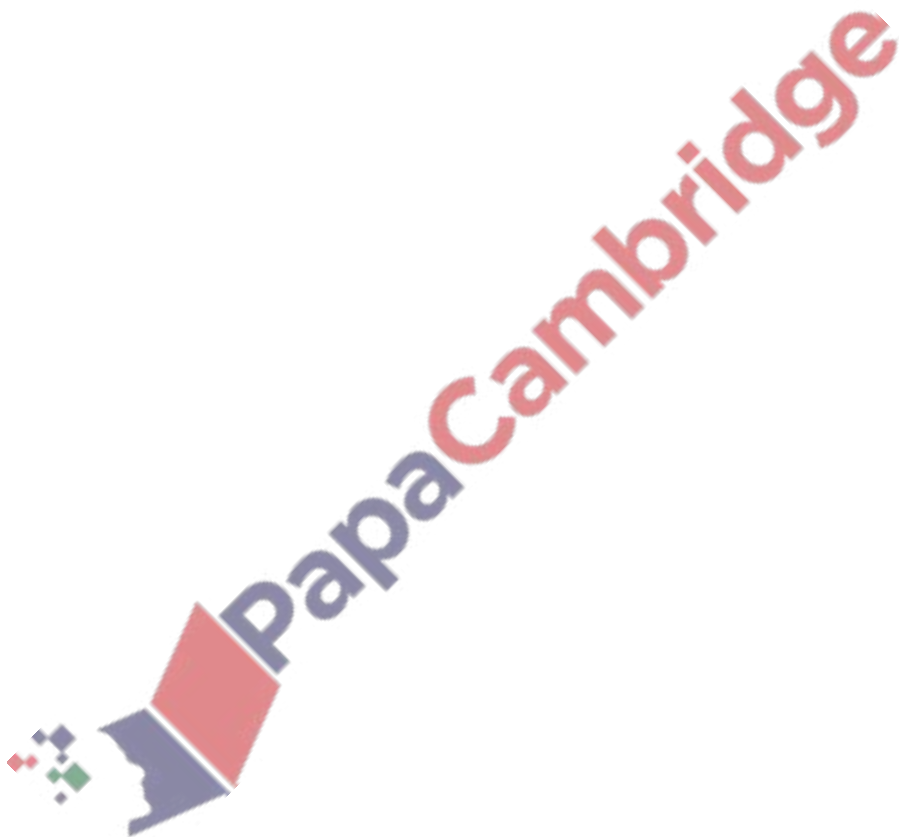
[1]



**DO NOT USE A CALCULATOR IN THIS QUESTION.**

(a) Show that  $x + 3$  is a factor of  $-12 + 23x + 3x^2 - 2x^3$ . [1]

(b) The curve  $y = -5 + 33x + 3x^2 - 2x^3$  and the line  $y = 10x + 7$  intersect at three points,  $A$ ,  $B$  and  $C$ . These points are such that the  $x$ -coordinate of  $A$  has the least value and the  $x$ -coordinate of  $C$  has the greatest value. Show that  $B$  is the mid-point of  $AC$ . [7]



7. June/2023/Paper\_0606/23/No.4

The polynomial  $p$  is such that  $p(x) = 2x^3 + 11x^2 + 22x + 40$ .

(a) Show that  $x = -4$  is a root of the equation  $p(x) = 0$ . [1]

(b) Factorise  $p(x)$  and hence show that  $p(x) = 0$  has no other real roots. [4]

