

3. Simplify

$$\frac{5 - 2\sqrt{3}}{\sqrt{3} - 1}$$

giving your answer in the form $p + q\sqrt{3}$, where p and q are rational numbers.

(4)



5.

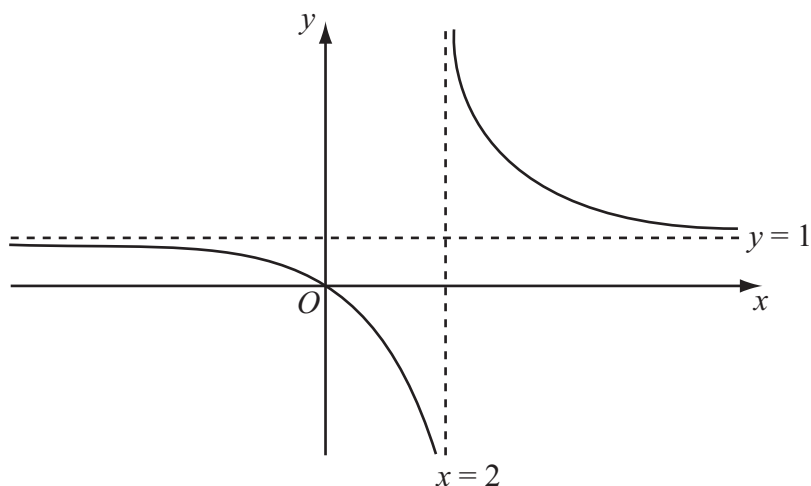
**Figure 1**

Figure 1 shows a sketch of the curve with equation $y = f(x)$ where

$$f(x) = \frac{x}{x-2}, \quad x \neq 2$$

The curve passes through the origin and has two asymptotes, with equations $y = 1$ and $x = 2$, as shown in Figure 1.

- (a) In the space below, sketch the curve with equation $y = f(x-1)$ and state the equations of the asymptotes of this curve. **(3)**
- (b) Find the coordinates of the points where the curve with equation $y = f(x-1)$ crosses the coordinate axes. **(4)**



9. The line L_1 has equation $2y - 3x - k = 0$, where k is a constant.

Given that the point $A(1, 4)$ lies on L_1 , find

(a) the value of k , (1)

(b) the gradient of L_1 . (2)

The line L_2 passes through A and is perpendicular to L_1 .

(c) Find an equation of L_2 giving your answer in the form $ax + by + c = 0$, where a , b and c are integers. (4)

The line L_2 crosses the x -axis at the point B .

(d) Find the coordinates of B . (2)

(e) Find the exact length of AB . (2)



10. (a) On the axes below, sketch the graphs of

(i) $y = x(x+2)(3-x)$

(ii) $y = -\frac{2}{x}$

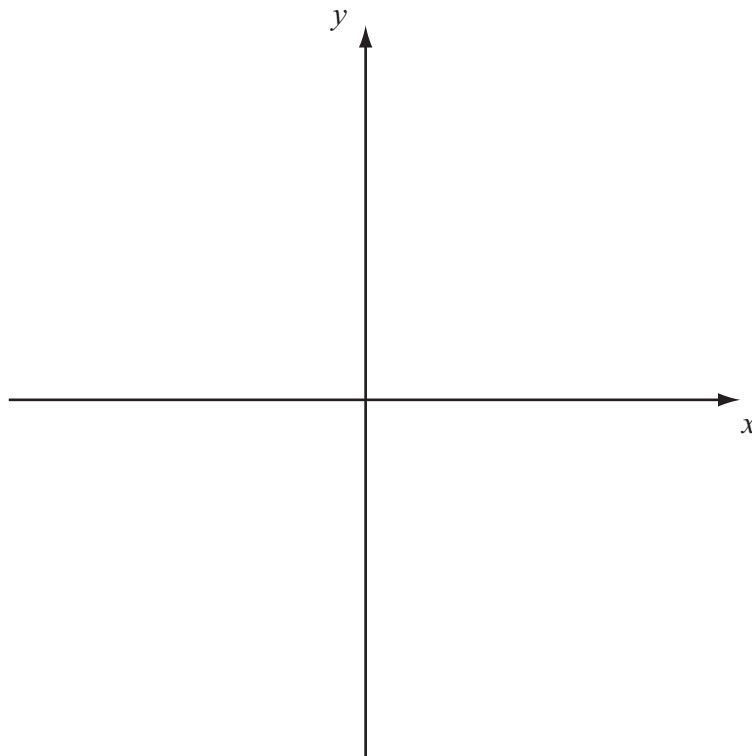
showing clearly the coordinates of all the points where the curves cross the coordinate axes.

(6)

(b) Using your sketch state, giving a reason, the number of real solutions to the equation

$$x(x+2)(3-x) + \frac{2}{x} = 0$$

(2)



Question 10 continued

Lined writing area for the answer to Question 10.

(Total 8 marks)

Q10



11. The curve C has equation

$$y = \frac{1}{2}x^3 - 9x^{\frac{3}{2}} + \frac{8}{x} + 30, \quad x > 0$$

- (a) Find $\frac{dy}{dx}$. (4)
- (b) Show that the point $P(4, -8)$ lies on C . (2)
- (c) Find an equation of the normal to C at the point P , giving your answer in the form $ax + by + c = 0$, where a , b and c are integers. (6)



