

(2)

1049

(2)

(2)



3. Given that $y = 3x^2 + 4\sqrt{x}$, $x > 0$, find

$$(a) \frac{dy}{dx}, \quad (2)$$

$$(b) \frac{d^2 y}{dx^2}, \quad (2)$$

$$(c) \int y dx . \tag{3}$$

- (a) Find the amount she saves in Week 200.

(3)

- (3)

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

5.

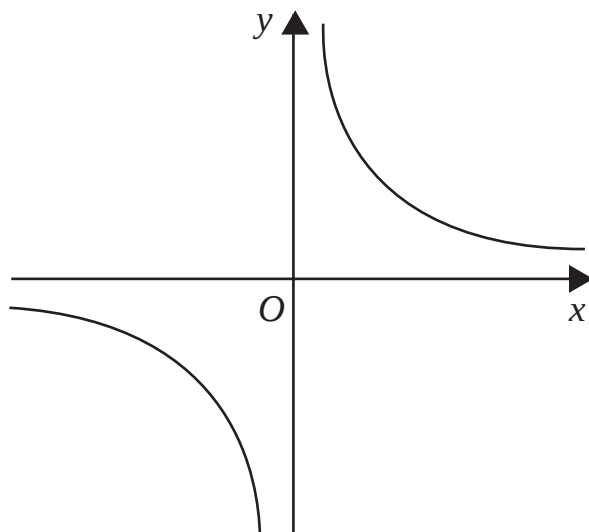


Figure 1

Figure 1 shows a sketch of the curve with equation $y = \frac{3}{x}$, $x \neq 0$.

- (a) On a separate diagram, sketch the curve with equation $y = \frac{3}{x+2}$, $x \neq -2$,
showing the coordinates of any point at which the curve crosses a coordinate axis. (3)
- (b) Write down the equations of the asymptotes of the curve in part (a). (2)





7. The equation $x^2 + kx + (k + 3) = 0$, where k is a constant, has different real roots.

(a) Show that $k^2 - 4k - 12 > 0$.

(2)

(b) Find the set of possible values of k .

(4)

[illegible]

8. A sequence $a_1, a_2, a_3, \dots$ is defined by

$$a_1 = k,$$

$$a_{n+1} = 3a_n + 5, \quad n \geq 1,$$

where k is a positive integer.

- (a) Write down an expression for a_2 in terms of k .

(1)

- (b) Show that $a_3 = 9k + 20$.

(2)

- (c) (i) Find $\sum_{r=1}^4 a_r$ in terms of k .

- (ii) Show that $\sum_{r=1}^4 a_r$ is divisible by 10.

(4)

This image shows a full page of blank, lined paper. It features approximately 20 horizontal blue or grey lines spaced evenly apart, typical of notebook paper. The lines extend across the entire width of the page, leaving small margins at the top and bottom. There are no vertical lines, text, or other markings on the page.

9. The curve C with equation $y = f(x)$ passes through the point $(5, 65)$.

Given that $f'(x) = 6x^2 - 10x - 12$,

- (a) use integration to find $f(x)$. (4)

- (b) Hence show that $f(x) = x(2x + 3)(x - 4)$. (2)

- (c) In the space provided on page 17, sketch C , showing the coordinates of the points where C crosses the x -axis. (3)

[illegible]

Question 9 continued

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

1

(Total 9 marks)



Turn over

10. The curve C has equation $y = x^2(x-6) + \frac{4}{x}$, $x > 0$.

The points P and Q lie on C and have x -coordinates 1 and 2 respectively.

- (a) Show that the length of PQ is $\sqrt{170}$. (4)

- (b) Show that the tangents to C at P and Q are parallel. (5)

- (c) Find an equation for the normal to C at P , giving your answer in the form $ax + by + c = 0$, where a , b and c are integers.
- (4)**

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

11. The line l_1 has equation $y = 3x + 2$ and the line l_2 has equation $3x + 2y - 8 = 0$.

(a) Find the gradient of the line l_2 .

(2)

The point of intersection of l_1 and l_2 is P .

(b) Find the coordinates of P .

(3)

The lines l_1 and l_2 cross the line $y=1$ at the points A and B respectively.

(c) Find the area of triangle ABP .

(4)



