

(3)

100

$x^3 - 9x.$

(3)

3



H 2 9 9 9 2 A 0 3 2 8

3.

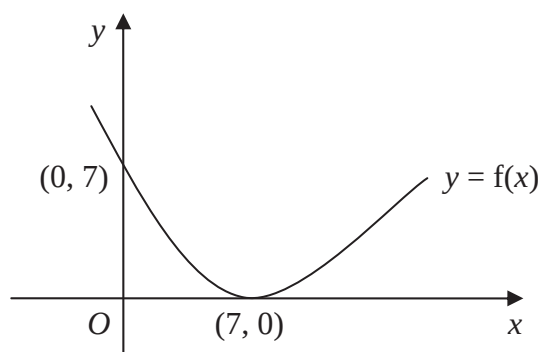


Figure 1

Figure 1 shows a sketch of the curve with equation $y = f(x)$. The curve passes through the point $(0, 7)$ and has a minimum point at $(7, 0)$.

On separate diagrams, sketch the curve with equation

(a) $y = f(x) + 3$, (3)

(b) $y = f(2x)$. (2)

On each diagram, show clearly the coordinates of the minimum point and the coordinates of the point at which the curve crosses the y-axis.



4.

$$f(x) = 3x + x^3, \quad x > 0.$$

(a) Differentiate to find $f'(x)$.

(2)

Given that $f'(x) = 15$,

(b) find the value of x .

(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. A sequence $x_1, x_2, x_3, \dots$ is defined by

$$x_1 = 1,$$

$$x_{n+1} = ax_n - 3, \quad n \geq 1,$$

where a is a constant.

- (a) Find an expression for x_2 in terms of a .

(1)

- (b) Show that $x_3 = a^2 - 3a - 3$.

(2)

Given that $x_3 = 7$,

- (c) find the possible values of a .

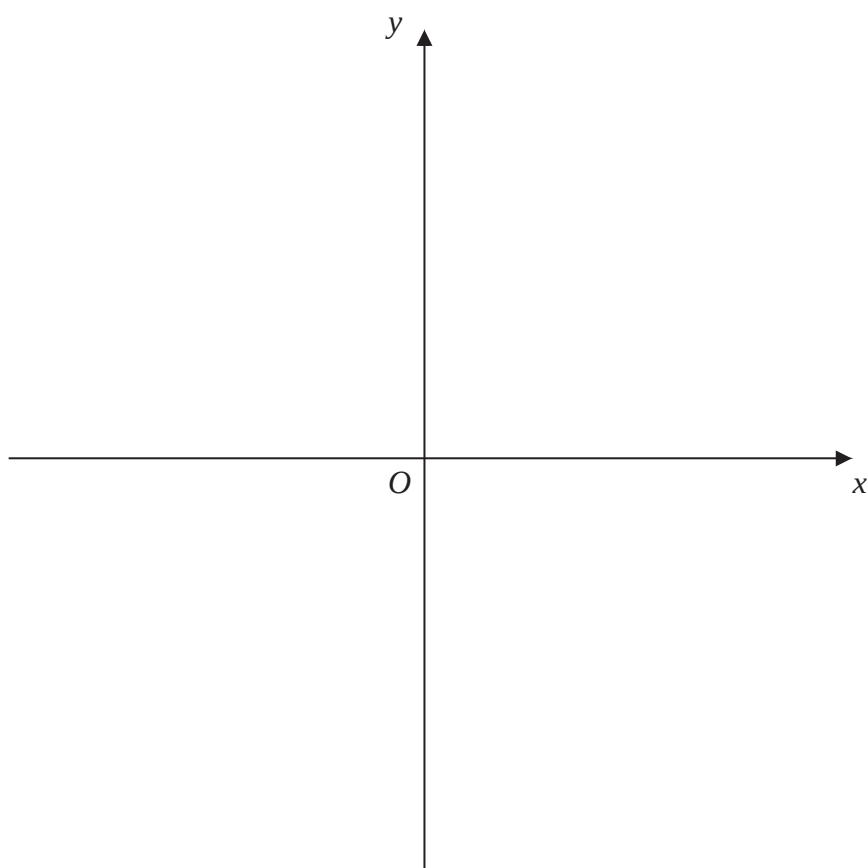
(3)

[illegible]

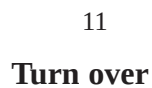
6. The curve C has equation $y = \frac{3}{x}$ and the line l has equation $y = 2x + 5$.

(a) On the axes below, sketch the graphs of C and l , indicating clearly the coordinates of any intersections with the axes. (3)

(b) Find the coordinates of the points of intersection of C and l . (6)



(Total 9 marks)



- (c) Show that the total distance she runs on Saturdays in n weeks of training is $n(n + 4)$ km. (3)

(d) Find the value of n . (2)

- (e) Find the total distance, in km, Sue runs on Saturdays in n weeks of training. (2)

This image shows a full page of blank, lined paper. It features approximately 20 evenly spaced horizontal grey lines across its entire width, providing a template for handwriting practice or general note-taking. The margins are consistent on all sides.

- (a) show that $q^2 + 8q < 0$.

(2)

- (b) Hence find the set of possible values of q .

(3)



10.

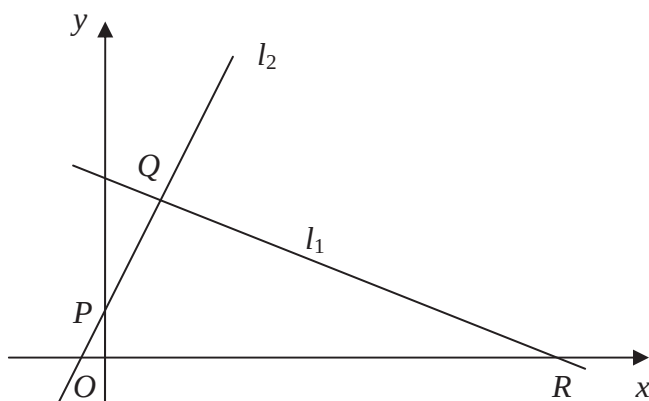


Figure 2

The points $Q(1, 3)$ and $R(7, 0)$ lie on the line l , as shown in Figure 2.

The length of QR is $a\sqrt{5}$.

- (a) Find the value of a .

(3)

The line l_2 is perpendicular to l_1 , passes through Q and crosses the y -axis at the point P , as shown in Figure 2.

Find

- (b) an equation for l_2 ,

(5)

- (c) the coordinates of P ,

(1)

- (d) the area of $\triangle PQR$.

(4)





11. The gradient of a curve C is given by $\frac{dy}{dx} = \frac{(x^2 + 3)^2}{x^2}$, $x \neq 0$.

(a) Show that $\frac{dy}{dx} = x^2 + 6 + 9x^{-2}$.

(2)

The point $(3, 20)$ lies on C .

(b) Find an equation for the curve C in the form $y = f(x)$.

(6)

[illegible]

(Total 8 marks)

TOTAL FOR PAPER: 75 MARKS

END

