

1.

$$g(x) = \frac{6x + 12}{x^2 + 3x + 2} - 2, \quad x \geq 0$$

(a) Show that $g(x) = \frac{4 - 2x}{x + 1}, \quad x \geq 0$

(3)

(b)

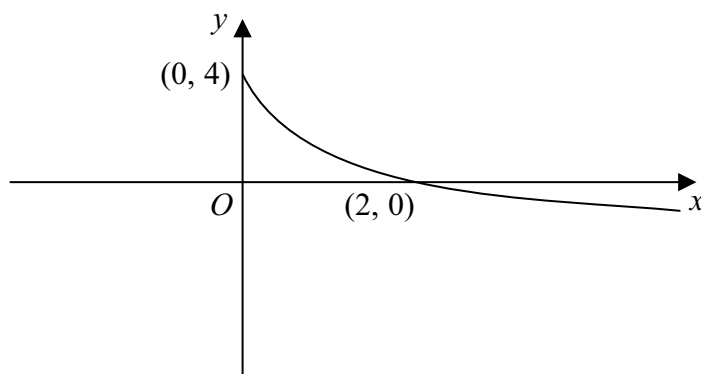


Figure 1

Figure 1 shows a sketch of the curve with equation $y = g(x), \quad x \geq 0$

The curve meets the y -axis at $(0, 4)$ and crosses the x -axis at $(2, 0)$.

On separate diagrams sketch the graph with equation

(i) $y = 2g(2x),$

(ii) $y = g^{-1}(x).$

Show on each sketch the coordinates of each point at which the graph meets or crosses the axes.

(5)







3.

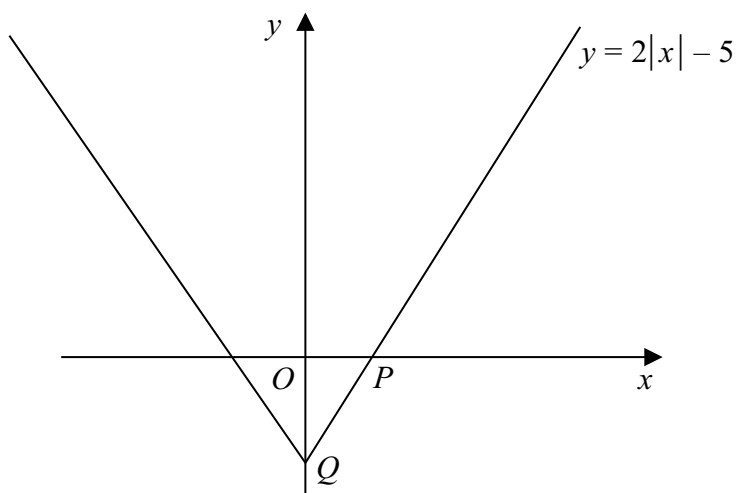


Figure 2

Figure 2 shows a sketch of the graph with equation $y = 2|x| - 5$.

The graph intersects the positive x -axis at the point P and the negative y -axis at the point Q .

- (a) State the coordinates of P and the coordinates of Q .

(2)

- (b) Solve the equation

$$2|x| - 5 = 3 - x$$

(3)



4. (a) On the same diagram, sketch and clearly label the graphs with equations

$$y = e^x \quad \text{and} \quad y = 10 - x$$

Show on your sketch the coordinates of each point at which the graphs cut the axes.

(3)

- (b) Explain why the equation $e^x - 10 + x = 0$ has only one solution.

(1)

- (c) Show that the solution of the equation

$$e^x - 10 + x = 0$$

lies between $x = 2$ and $x = 3$

(2)

- (d) Use the iterative formula

$$x_{n+1} = \ln(10 - x_n), \quad x_1 = 2$$

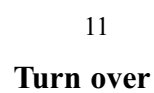
to calculate the values of x_2 , x_3 and x_4 .

Give your answers to 4 decimal places.

(3)



Question 4 continued

[illegible]

(b) Find the exact coordinates of P . Give your answer in its simplest form. (4)

Find $\frac{dy}{dx}$, and show that C has no turning points.



6.

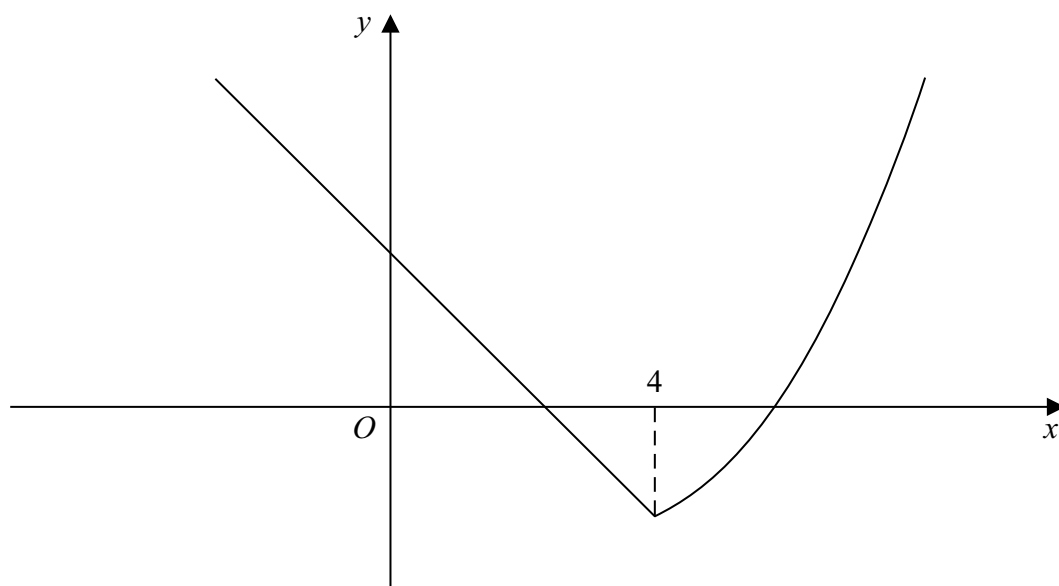


Figure 3

Figure 3 shows a sketch of the graph of $y = f(x)$ where

$$f(x) = \begin{cases} 5 - 2x, & x \leq 4 \\ e^{2x-8} - 4, & x > 4 \end{cases}$$

(a) State the range of $f(x)$. (1)

(b) Determine the exact value of $ff(0)$. (2)

(c) Solve $f(x) = 21$
Give each answer as an exact answer. (5)

(d) Explain why the function f does not have an inverse. (1)







(3)

- (ii) Find the value of θ , for $0 < \theta < 2\pi$, at which this maximum occurs.

(3)

$$H = 10 - 9 \cos\left(\frac{\pi t}{5}\right) + 2 \sin\left(\frac{\pi t}{5}\right)$$

- (c) Calculate the maximum value of H predicted by this model, and the value of t , when this maximum first occurs. Give your answers to 2 decimal places.

(4)

- (d) Determine the time for the Ferris wheel to complete two revolutions.

(2)

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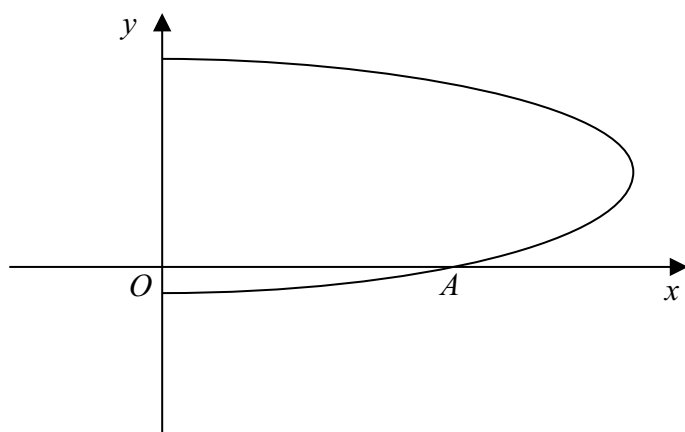


Figure 4

The curve crosses the x -axis at the point A .

- (a) State the coordinates of A . **(1)**
- (b) Find an expression for $\frac{dx}{dy}$, in terms of y . **(3)**
- (c) Find an equation of the tangent to the curve at A . **(4)**



Question 9 continued

(Total 8 marks)

TOTAL FOR PAPER: 75 MARKS

END

