



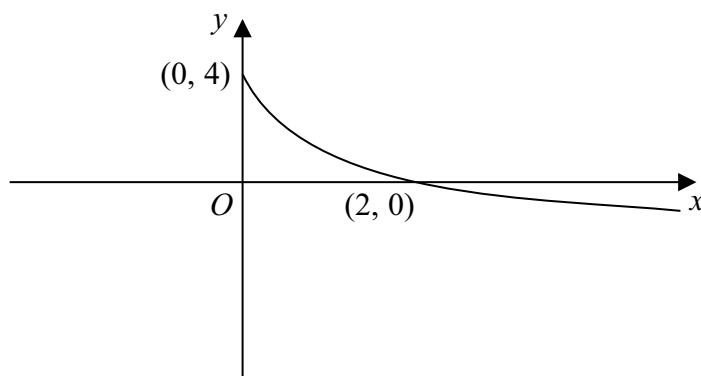
**1.**

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

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

(3)

(b)



### Figure 1

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

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)





2. Given that  $\tan 40^\circ = p$ , find in terms of  $p$

(a)  $\cot 40^\circ$

(1)

(b)  $\sec 40^\circ$

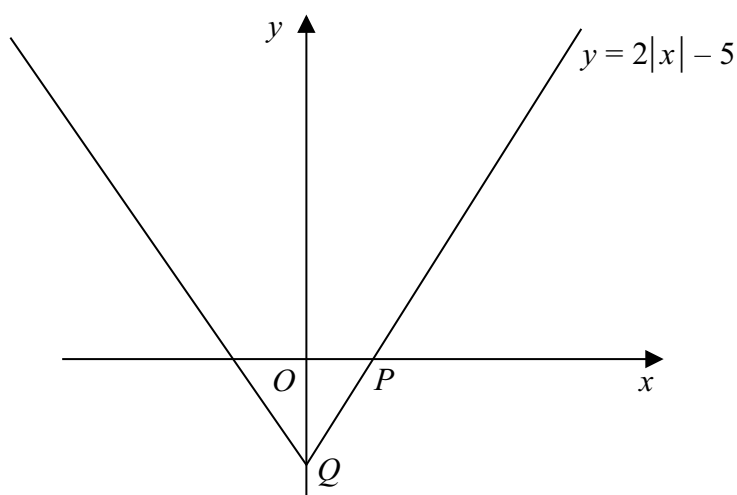
(2)

(c)  $\tan 85^\circ$

**(2)**



**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

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

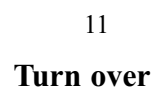
to calculate the values of  $x_2$ ,  $x_3$  and  $x_4$ .

Give your answers to 4 decimal places.

(3)



### Question 4 continued

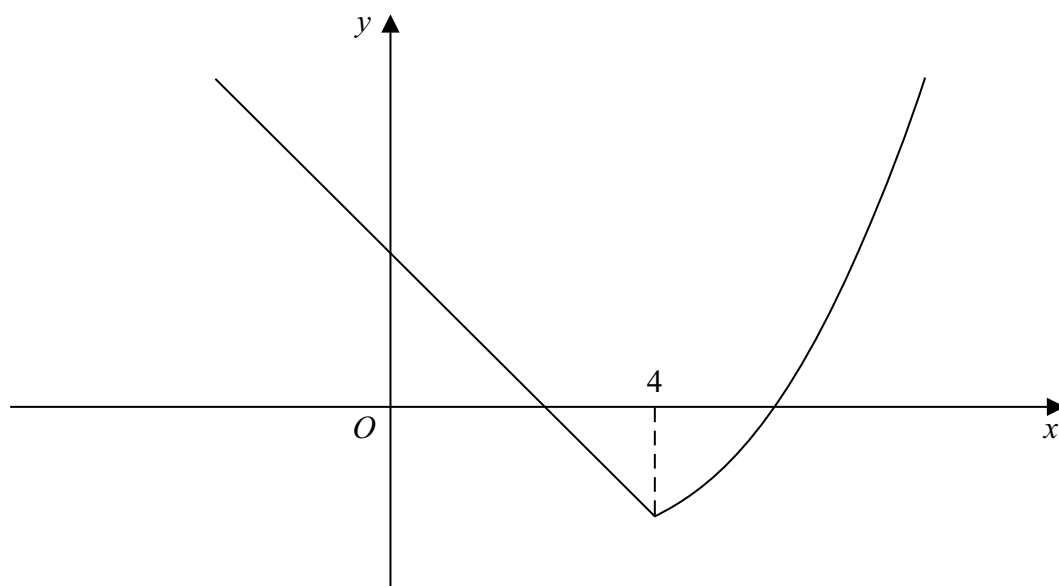
This image shows a full page of blank, lined paper. It features approximately 20 evenly spaced horizontal grey lines across its entire width, providing a template for writing or drawing. The margins are consistent on all sides.

(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)

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- Give the exact value of  $R$  and give the value of  $\alpha$  to 4 decimal places.

(b) (i) State the maximum value of  $9 \cos \theta - 2 \sin \theta$

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

where  $H$  is measured in metres and  $t$  is the time in minutes after the wheel starts turning.

- (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.

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

[illegible]

**Question 8 continued**

[illegible]

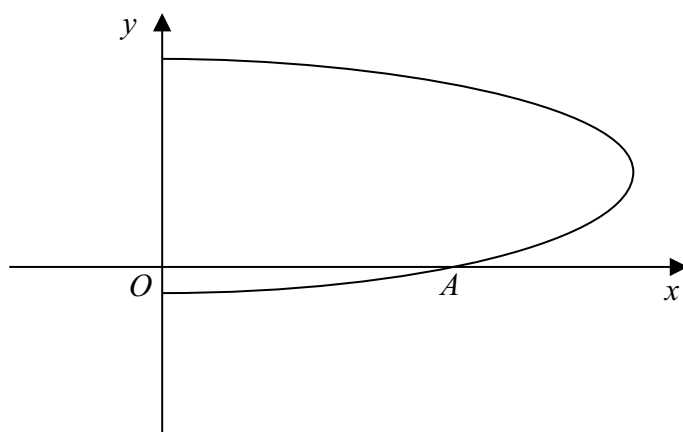


Figure 4 shows a sketch of the curve with equation  $x = (9 + 16y - 2y^2)^{\frac{1}{2}}$ .

(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)

[illegible]

**Q9**

**(Total 8 marks)**

**TOTAL FOR PAPER: 75 MARKS**

**END**