

QQQ – Further Pure 1 – Chapter 4 – Inequalities (Version 2)

Total Marks: 24

(24 = Platinum, 22 = Gold, 19 = Silver, 16 = Bronze)

1. Use algebra to determine the values of x for which

$$|x^2 - 2x| \leq x$$

(4)

(Total 4 marks)

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2. A student was set the following problem.

Use algebra to find the set of values of x for which

$$\frac{x}{x-24} > \frac{1}{x+11}$$

The student's attempt at a solution is written below.

$$x(x-24)(x+11)^2 > (x+11)(x-24)^2$$

$$x(x-24)(x+11)^2 - (x+11)(x-24)^2 > 0$$

$$(x-24)(x+11)[x(x+11) - x - 24] > 0 \quad \text{Line 3}$$

$$(x-24)(x+11)[x^2 + 10x - 24] > 0$$

$$(x-24)(x+11)(x+12)(x-2) > 0$$

$$x = 24, x = -11, x = -12, x = 2$$

$$\{x \in \mathbb{R} : -12 < x < -11\} \cup \{x \in \mathbb{R} : 2 < x < 24\} \quad \text{Line 7}$$

There are errors in the student's solution.

- (a) Identify the error made

(i) in line 3

(ii) in line 7

(2)

- (b) Find a correct solution to this problem.

(4)

(Total 6 marks)

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3.

In this question you must show all stages of your working.

Solutions relying entirely on calculator technology are not acceptable.

Use algebra to determine the values of x for which

$$\frac{x^2 - 4}{|x - 5|} > 4x + 8$$

(6)

(Total 6 marks)

4.

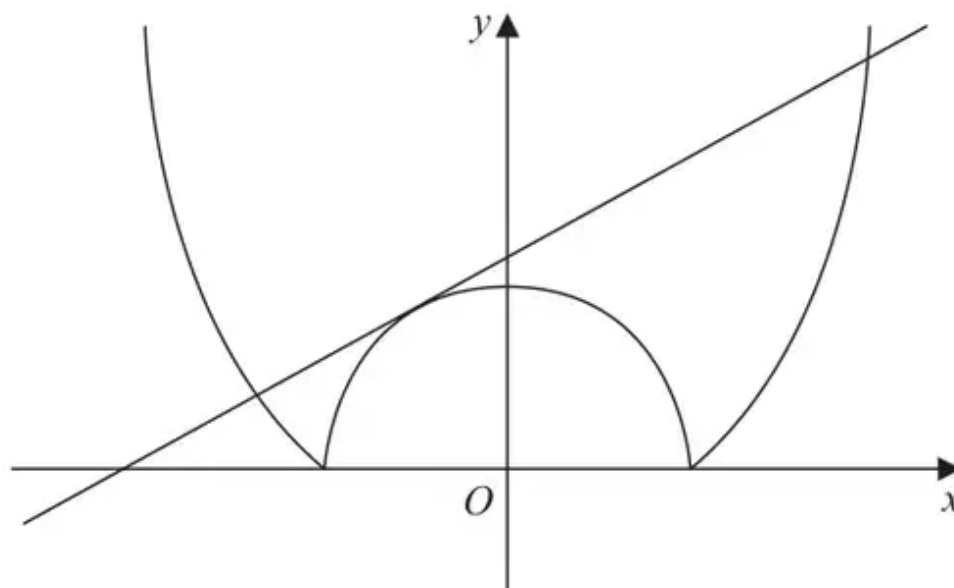


Figure 1

Figure 1 shows a sketch of the curve with equation $y = |x^2 - 8|$ and a sketch of the straight line with equation $y = mx + c$, where m and c are positive constants.

The equation

$$|x^2 - 8| = mx + c$$

has exactly 3 roots, as shown in Figure 1.

(a) Show that

$$m^2 - 4c + 32 = 0 \quad (2)$$

Given that $c = 3m$

(b) determine the value of m and the value of c (3)

(c) Hence solve

$$|x^2 - 8| \geq mx + c \quad (3)$$

(Total 8 marks)