

1.

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

Solutions relying entirely on calculator technology are not acceptable.

Solve, for $0 < \theta \leq 360^\circ$, the equation

$$3 \tan^2 \theta + 7 \sec \theta - 3 = 0$$

giving your answers to one decimal place.

(5)

6. The function f is defined by

$$f(x) = \frac{4x+3}{x-2} \quad x \neq 2$$

(a) Find f^{-1}

(3)

(b) Show that

$$ff(x) = \frac{ax+b}{cx+d}$$

where a, b, c and d are integers to be found.

(3)

The point $P(3, 15)$ lies on the curve with equation $y = f(x)$.

(c) Find the point to which P is mapped when $y = f(x)$ is transformed to the curve with equation $y = 2f(3x) + 8$

(2)

4:

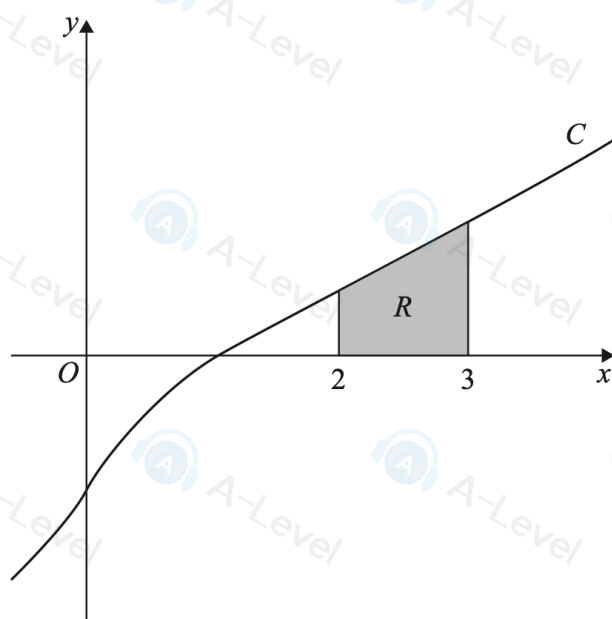


Figure 1

In this question you must show all stages of your working.
Solutions relying on calculator technology are not acceptable.

Figure 1 shows a sketch of part of the curve C with equation $y = g(x)$ where

$$g(x) = \frac{3x^3 - 5x^2 + 7x - 5}{x^2 + 1}$$

Given that

$$\frac{3x^3 - 5x^2 + 7x - 5}{x^2 + 1} \equiv Ax + B + \frac{Cx + D}{x^2 + 1}$$

(a) (i) find the values of the constants A , B and C

(ii) show that $D = 0$

(4)

The finite region R , shown shaded in Figure 1, is bounded by C , the x -axis and the lines with equations $x = 2$ and $x = 3$

(b) Find the exact area of region R using algebraic integration.

Give the answer in the form $\alpha + \ln \beta$ where α and β are constants to be found.

(4)

10:

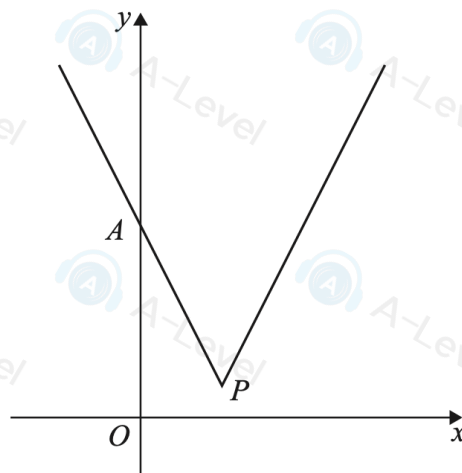


Figure 3

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

$$f(x) = |kx - 10| + k \quad x \in \mathbb{R}$$

and k is a positive constant.

The graph

- cuts the y -axis at the point A
- has a vertex at the point P

(a) Find, in simplest form in terms of k ,

(i) the y coordinate of A

(ii) the coordinates of P

(3)

(b) Find, in terms of k , the range of values of x which satisfy

$$|kx - 10| + k \geq 2k$$

(3)

Given that the line with equation $y = 3x + 1$ intersects the graph of $y = f(x)$ at 2 distinct points,

(c) find the range of values of k .

(4)

7.

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

Solutions relying entirely on calculator technology are not acceptable.

(a) Given that

$$\sqrt{2} \sin(x + 45^\circ) = \cos(x - 60^\circ)$$

show that

$$\tan x = -2 - \sqrt{3}$$

(4)

(b) Hence or otherwise, solve, for $0 \leq \theta < 180^\circ$

$$\sqrt{2} \sin(2\theta) = \cos(2\theta - 105^\circ)$$

(4)

6.

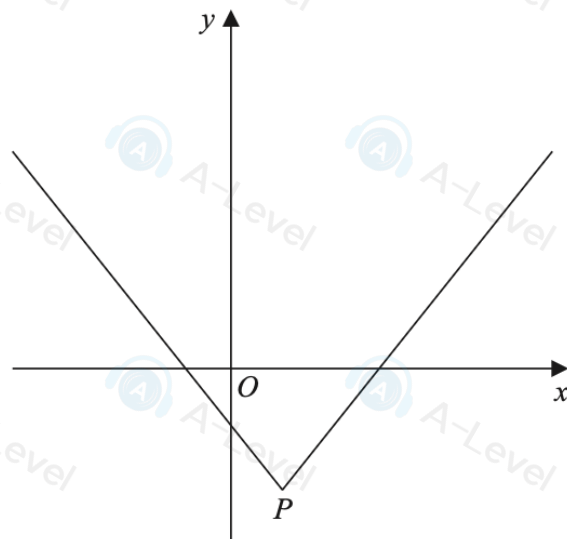


Figure 2

Figure 2 shows a sketch of the graph $y = f(x)$, where

$$f(x) = 3|x - 2| - 10$$

The vertex of the graph is at point P , shown in Figure 2.

(a) Find the coordinates of P

(2)

(b) Find $ff(0)$

(2)

(c) Solve the inequality

$$3|x - 2| - 10 < 5x + 10$$

(2)

(d) Solve the equation

$$f(|x|) = 0$$

(3)

DO NOT WRITE IN THIS AREA

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DO