Further algebra and functions – A2 Further Mathematics P2

1. June/2022/Paper_7367/02/No.3

   The roots of the equation $x^2 - px - 6 = 0$ are α and β

   Find $\alpha^2 + \beta^2$ in terms of p

   Circle your answer.

   [1 mark]

   $p^2 - 6$ $\qquad$ $p^2 + 6$ $\qquad$ $p^2 - 12$ $\qquad$ $p^2 + 12$

2. June/2022/Paper_7367/02/No.7

   The function f is defined by

   $$f(x) = \frac{ax - 5}{2x + b} \qquad x \in \mathbb{R}, x \neq \frac{9}{2}$$

   where a and b are integers.

   The graph of $y = f(x)$ has asymptotes $x = \frac{9}{2}$ and $y = 3$

   (a)   Find the value of a and the value of b

   [2 marks]

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(b) Solve the inequality

$$f(x) \leq x + 2$$

Fully justify your answer.

[6 marks]

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3.

   (a)   The function f is defined as $f(x) = \sec x$

   (a) (i)   Show that $f^{(4)}(0) = 5$

                                                 [4 marks]

The function f is defined as $f(x) = \sec x$

(a) (ii) Hence find the first three non-zero terms of the Maclaurin series for $f(x) = \sec x$

[2 marks]

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(b) Prove that

$$\lim_{x \to 0} \left(\frac{\sec x - \cosh x}{x^4} \right) = \frac{1}{6}$$

[4 marks]

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4.

The curve C_1 has equation

$$\frac{x^2}{25} - \frac{y^2}{4} = 1$$

The curve C_2 has equation

$$x^2 - 25y^2 - 6x - 200y - 416 = 0$$

(a)   Find a sequence of transformations that maps the graph of C_1 onto the graph of C_2

[4 marks]

(b) Find the equations of the asymptotes to C_2

Give your answers in the form $ax + by + c = 0$ where a, b and c are integers.

[3 marks]

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