

Short Assessment

Time Allowed: 25 minutes

Total Marks: 26

1.

$$f(x) = 12 \cos x - 4 \sin x.$$

Given that $f(x) = R \cos(x + \alpha)$, where $R \geq 0$ and $0 \leq \alpha \leq 90^\circ$,

(a) find the value of R and the value of α .

(4)

(b) Hence solve the equation

$$12 \cos x - 4 \sin x = 7$$

for $0 \leq x < 360^\circ$, giving your answers to one decimal place.

(5)

(c) (i) Write down the minimum value of $12 \cos x - 4 \sin x$.

(1)

(ii) Find, to 2 decimal places, the smallest positive value of x for which this minimum value occurs.

(2)

2.

(a)

Show that

$$\frac{\cos 2x}{\cos x + \sin x} \equiv \cos x - \sin x, \quad x \neq \left(n - \frac{1}{4}\right)\pi, \quad n \in \mathbb{Z}, \quad (2)$$

(b)

Solve, for $0 \leq \theta < 2\pi$,

$$\sin 2\theta = \cos 2\theta,$$

giving your answers in terms of π .

(4)

3.

The functions f and g are defined with their respective domains by

$$f(x) = x^2 \quad \text{for all real values of } x$$

$$g(x) = \frac{1}{x+2} \quad \text{for real values of } x, \quad x \neq -2$$

- (a) State the range of f . *(1 mark)*
- (b) (i) Find $fg(x)$. *(1 mark)*
- (ii) Solve the equation $fg(x) = 4$. *(3 marks)*
- (c) (i) Explain why the function f does **not** have an inverse. *(1 mark)*
- (ii) The inverse of g is g^{-1} . Find $g^{-1}(x)$. *(2 marks)*

- End of Test -

