Simplifying sin +/- cos Functions Difficulty: Easy

Question Paper 2

Level	A Level only
Subject	Maths - Pure
Exam Board	Edexcel
Topic	Trigonometry & Modelling
Sub-Topic	Simplifying sin +/- cos Functions
Difficulty	Easy
Booklet	Question Paper 2

Time allowed: **44 minutes**

Score: **/37**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>76%	61%	52%	42%	33%	23%	<23%

(i) Solve, for $0 \leq \theta < 360°$, the equation

$$5\sin\theta - 5\cos\theta = 2$$

giving your answers to one decimal place.

(*Solutions based entirely on graphical or numerical methods are not acceptable.*) **(5)**

(Total 5 marks)

In a particular circuit the current, I amperes, is given by

$$I = 4 \sin \theta - 3 \cos \theta, \quad \theta > 0,$$

where θ is an angle related to the voltage.

Given that $I = R \sin (\theta - \alpha)$, where $R > 0$ and $0 \leqslant \alpha < 360°$,

(a) find the value of R, and the value of α to 1 decimal place. **(4)**

(b) Hence solve the equation $4 \sin \theta - 3 \cos \theta = 3$ to find the values of θ between 0 and 360°. **(5)**

(c) Write down the greatest value for I. **(1)**

(d) Find the value of θ between 0 and 360° at which the greatest value of I occurs. **(2)**

(Total 12 marks)

$$f(x) = 5\cos x + 12\sin x$$

Given that $f(x) = R\cos(x - \alpha)$, where $R > 0$ and $0 < \alpha < \frac{\pi}{2}$,

(a) find the value of R and the value of α to 3 decimal places. **(4)**

(b) Hence solve the equation

$$5\cos x + 12\sin x = 6$$

for $0 \leq x < 2\pi$. **(5)**

(c) (i) Write down the maximum value of $5\cos x + 12\sin x$. **(1)**

(ii) Find the smallest positive value of x for which this maximum value occurs.

(2)

(Total 12 marks)

(a) Express $6\cos\theta + 8\sin\theta$ in the form $R\cos(\theta - \alpha)$, where $R > 0$ and $0 < \alpha < \frac{\pi}{2}$

Give the value of α to 3 decimal places. **(4)**

(b) $$p(\theta) = \frac{4}{12 + 6\cos\theta + 8\sin\theta}, \quad 0 \leq \theta \leq 2\pi$$

Calculate

(i) the maximum value of $p(\theta)$, **(4)**

(ii) the value of θ at which the maximum occurs.

(Total 8 marks)