Year 2 Pure Chapter 7: asinx + bcosx- Exam Questions (63 mins)

1.

The diagram above shows an oscilloscope screen.

The curve shown on the screen satisfies the equation

(a) Express the equation of the curve in the form $y = R\sin(x + \alpha)$, where R and α are constants, $R > 0$ and $0 < \alpha <$

(4)

(b) Find the values of x, $0 \leq x < 2\pi$, for which $y = 1$.

(4)
(Total 8 marks)

2. (a) Express $5 \cos x - 3 \sin x$ in the form $R \cos(x + \alpha)$, where $R > 0$ and $0 < \alpha <$

(4)

(b) Hence, or otherwise, solve the equation

$$5 \cos x - 3 \sin x = 4$$

for $0 \ x < 2$, giving your answers to 2 decimal places.

(5)
(Total 9 marks)

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

Given that $f(x) = R\cos(x - \alpha)$, where $R > 0$ and ,

(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)

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

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

(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 $0 \leq x \leq 360°$, 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)

(Total 12 marks)

5. 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 $0 \leq \alpha < 360°$,

(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)