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2002

XVIII

1583

Time allowed

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/

Percentage

%

Maths

Topic Questions

AQA
AS & A LEVEL

3.6 E: Trigonometry

3   It is given that $3\cos\theta - 2\sin\theta = R\cos(\theta + \alpha)$, where $R > 0$ and $0° < \alpha < 90°$.

    (a)   Find the value of R.   *(1 mark)*

    (b)   Show that $\alpha \approx 33.7°$.   *(2 marks)*

    (c)   Hence write down the maximum value of $3\cos\theta - 2\sin\theta$ and find a **positive** value of θ at which this maximum value occurs.   *(3 marks)*

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6   (a)   Express $\cos 2x$ in the form $a\cos^2 x + b$, where a and b are constants.   *(2 marks)*

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4   (a)   (i)   Express $\sin 2x$ in terms of $\sin x$ and $\cos x$.   *(1 mark)*

          (ii)   Express $\cos 2x$ in terms of $\cos x$.   *(1 mark)*

    (b)   Show that

$$\sin 2x - \tan x = \tan x \cos 2x$$

        for all values of x.   *(3 marks)*

    (c)   Solve the equation $\sin 2x - \tan x = 0$, giving all solutions in degrees in the interval $0° < x < 360°$.   *(4 marks)*

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3   (a)   Express $\cos 2x$ in terms of $\sin x$.   *(1 mark)*

    (b)   (i)   Hence show that $3\sin x - \cos 2x = 2\sin^2 x + 3\sin x - 1$ for all values of x.   *(2 marks)*

          (ii)   Solve the equation $3\sin x - \cos 2x = 1$ for $0° < x < 360°$.   *(4 marks)*

    (c)   Use your answer from part (a) to find $\displaystyle\int \sin^2 x \, dx$.   *(2 marks)*

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7 (a) Use the identity

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

to express $\tan 2x$ in terms of $\tan x$. *(2 marks)*

(b) Show that

$$2 - 2\tan x - \frac{2\tan x}{\tan 2x} = (1 - \tan x)^2$$

for all values of x, $\tan 2x \neq 0$. *(4 marks)*

3 (a) Express $4\cos x + 3\sin x$ in the form $R\cos(x - \alpha)$, where $R > 0$ and $0° < \alpha < 360°$, giving your value for α to the nearest $0.1°$. *(3 marks)*

(b) Hence solve the equation $4\cos x + 3\sin x = 2$ in the interval $0° < x < 360°$, giving all solutions to the nearest $0.1°$. *(4 marks)*

(c) Write down the minimum value of $4\cos x + 3\sin x$ and find the value of x in the interval $0° < x < 360°$ at which this minimum value occurs. *(3 marks)*