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A LEVEL MATHS

(37) Solving Trigonometric Equations

WORKING AT D/E

(1) (a) Use the formula book to show that $\sin 2x \equiv 2 \sin x \cos x$

(b) Hence, show that $\sin 2x = \sin x$ can be written as $\sin x(2 \cos x - 1) = 0$

(c) Using your answer to part (b) find the 5 solutions to the equation $\sin 2x = \sin x$, $0 \leq x \leq 360^o$

(2) (a) Using the formula book to show that

$$\cos(x - 30) \equiv \frac{\sqrt{3}}{2}\cos x + \frac{1}{2}\sin x$$

(b) Using your answer to part (a), solve the equation

$$\frac{\sqrt{3}}{2}\cos x + \frac{1}{2}\sin x = 1, \quad 0 \leq x \leq 360$$

(3) Using the formula book or otherwise, solve the equation: $\frac{2\tan x}{1-\tan^2 x} = 1$, $0 \leq x \leq 360$

WORKING AT B/C

(1) (a) Use the formula book with $A = \frac{1}{2}x$ and $B = \frac{1}{2}x$ so show that $\cos x = \cos^2 \frac{1}{2}x - \sin^2 \frac{1}{2}x$

(b) Hence, or otherwise, solve the equation

$\cos^2 \frac{1}{2}x - \sin^2 \frac{1}{2}x = 0.1, \quad 0 \leq x \leq 360^o$

Give each answer to 1 decimal place.

(2) (a) Write $4 \sin x \cos x$ in the form $p \sin qx$

(b) Hence, solve the equation $4 \sin x \cos x = 1$, $0 \leq x \leq 2\pi$, giving your answers as multiples of π

(3) (a) Show that

$$6 \sin x \cos x = 2(\cos^2 x - \sin^2 x)$$

can be written as $\tan 2x = \frac{2}{3}$

(b) Hence, solve the equation

$6 \sin x \cos x = 2(\cos^2 x - \sin^2 x)$, $0 < x < 360$

giving each answer to 3SF.

WORKING AT A*/A

(1) (a) Show that $2 \cos x - 2 \cos^3 x \equiv \sin x \sin 2x$

(b) Hence, or otherwise, find the exact solutions to the equation $2 \cos x = 2 \cos^3 x$, $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$

(2) (a) Show that $\cos(3x) \equiv 4 \cos^3 x - 4\cos x$

(b) Hence, or otherwise, solve the equation $4 \cos^3 3y - 4\cos 3y = 1, \quad 0 \leq y \leq \frac{\pi}{4}$

(3) Given that $12 \sin x \equiv k \sin y \cos y$, find a possible value of the constant k and hence express y in terms of x.