Air maths tuition

Interact, engage and perform

Trig Equation
| Past Paper Question | C3 Edexcel January 2012 Q5

Solve $2\cot^2 3\theta = 7\operatorname{cosec} 3\theta - 5$ for $0° \le \theta \le 180°$

$1 + \cot^2 x \equiv \operatorname{cosec}^2 x$

$\therefore \cot^2 x \equiv \operatorname{cosec}^2 x - 1$

$\therefore 2(\operatorname{cosec}^2 3\theta - 1) = 7\operatorname{cosec} 3\theta - 5$

$\therefore 2\operatorname{cosec}^2 3\theta - 2 = 7\operatorname{cosec} 3\theta - 5$

$\therefore 2\operatorname{cosec}^2 3\theta - 7\operatorname{cosec} 3\theta + 3 = 0$

$\therefore (2\operatorname{cosec} 3\theta - 1)(\operatorname{cosec} 3\theta - 3) = 0$

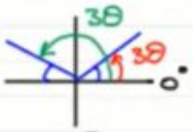
$\therefore 2\operatorname{cosec} 3\theta - 1 = 0$ or $\operatorname{cosec} 3\theta - 3 = 0$

$\therefore \operatorname{cosec} 3\theta = \frac{1}{2}$ or $\operatorname{cosec} 3\theta = 3$

$\therefore \frac{1}{\sin 3\theta} = \frac{1}{2}$ or $\frac{1}{\sin 3\theta} = 3$

$\therefore \sin 3\theta = 2$ (no solution) or $\sin 3\theta = \frac{1}{3}$

$\therefore 3\theta = \sin^{-1}\frac{1}{3}$



$\therefore 3\theta = 19.471...°, 160.528...°, 379.471...°, 520.528...°$

$\therefore \theta = 6.490...° \; 53.509...° \; 126.490...°, 173.509...°$

$\therefore \theta = 6.5°, 53.5°, 126.5, 173.5°$ (all 1dp)

With the acknowledgement of Exam Solutions.

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