

Cambridge International AS & A Level

Mathematics

9709

Paper 1 Pure Mathematics 1

Topic 5-Trigonometry

Question No (32)

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Question No (32)

- (i) Express the equation $\sin 2x + 3 \cos 2x = 3(\sin 2x - \cos 2x)$ in the form $\tan 2x = k$, where k is a constant.
- (ii) Hence solve the equation for $-90^\circ \leq x \leq 90^\circ$.

Solution

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(i)

$$\sin 2x + 3 \cos 2x = 3(\sin 2x - \cos 2x)$$

Dividing both sides by $\cos 2x$

$$\frac{\sin 2x}{\cos 2x} + 3 \frac{\cos 2x}{\cos 2x} = 3 \left(\frac{\sin 2x}{\cos 2x} - \frac{\cos 2x}{\cos 2x} \right)$$

$$\tan 2x + 3 = 3(\tan 2x - 1)$$

$$\tan 2x + 3 = 3 \tan 2x - 3$$

$$3 + 3 = 3 \tan 2x - \tan 2x$$

$$6 = 2 \tan 2x$$

$$\tan 2x = \frac{6}{2}$$

$$\tan 2x = 3$$

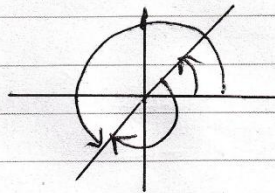
Answer

(ii)

$$\tan 2x = 3$$

$$-90^\circ \leq x \leq 90^\circ$$

$\tan$ is +ve in I and III quadrant



Basic angle

$$\alpha = \tan^{-1}(3)$$

$$\alpha = 71.6^\circ$$

$$2x = -(180 - 71.6^\circ), 71.6^\circ$$

$$2x = -108.4^\circ, 71.6^\circ$$

$$x = -54.2^\circ, 35.8^\circ$$