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Interact, engage and perform

Trig Equations - Double Angle Types (3)

Solve $3 \tan x = \tan 2x$ for $0 \leq x \leq 2\pi$ radians

$$\therefore 3 \tan x = \frac{2 \tan x}{1 - \tan^2 x}$$

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

$$\therefore 3 \tan x (1 - \tan^2 x) = 2 \tan x$$
$$\therefore 3 \tan x - 3 \tan^3 x = 2 \tan x$$
$$\therefore 3 \tan^3 x - \tan x = 0$$
$$\therefore \tan x (3 \tan^2 x - 1) = 0$$
$$\therefore \tan x = 0 \text{ or } 3 \tan^2 x - 1 = 0$$

when $\tan x = 0$
 $\therefore x = \tan^{-1} 0$
 $\therefore x = 0^\circ, \pi^\circ, 2\pi^\circ$

See next page for more



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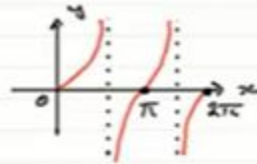
Interact, engage and perform

$$\therefore \tan x = 0 \text{ or } 3\tan^2 x - 1 = 0$$

when $\tan x = 0$

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$$\therefore x = 0^\circ, \pi^\circ, 2\pi^\circ$$

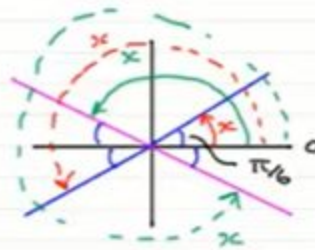


when $3\tan^2 x - 1 = 0$

$$\therefore \tan^2 x = \frac{1}{3}$$

$$\therefore \tan x = \pm \frac{1}{\sqrt{3}}$$

$$\therefore x = \tan^{-1} \left(\pm \frac{1}{\sqrt{3}} \right)$$



$$\therefore x = \frac{\pi}{6}^\circ, \frac{5\pi}{6}^\circ, \frac{7\pi}{6}^\circ, \frac{11\pi}{6}^\circ$$

$$\therefore x = 0^\circ, \frac{\pi}{6}^\circ, \frac{5\pi}{6}^\circ, \pi^\circ, \frac{7\pi}{6}^\circ, \frac{11\pi}{6}^\circ, 2\pi^\circ$$

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