

SOLUTIONS TRIG EQUATIONS 2

SOLUTIONS

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$$\textcircled{1} 3 \sin^2(x) \tan^2(x) - \sin^2(x) = 0$$

$$\Rightarrow \sin^2(x) (3 \tan^2(x) - 1) = 0$$

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

$$\Rightarrow \sin(x) = 0 \quad \Rightarrow \tan^2(x) = 1/3$$



$$\Rightarrow x = 0, x = \pi$$

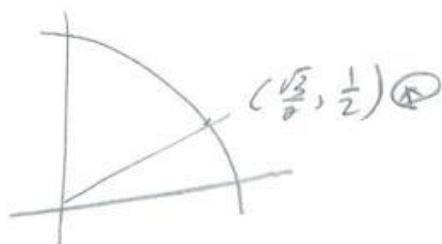
$$\Rightarrow \tan(x) = \frac{1}{\sqrt{3}}$$

Quadrant check

Q I Q III

$$x_R = \pi/6 \Rightarrow x = \pi/6, x = 7\pi/6$$

$$\Rightarrow \boxed{\{0, \pi, \pi/6, 7\pi/6\}}$$



$$\textcircled{2} \tan^2(x) - 1 = 0$$

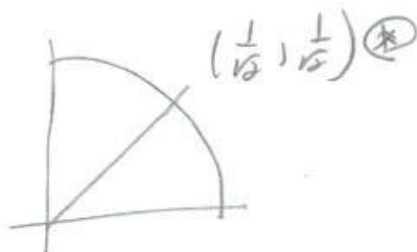
$$\Rightarrow \tan^2(x) = 1$$

$$\Rightarrow \tan(x) = \pm \sqrt{1} = \pm 1$$

Quad check $\Rightarrow$ ALL 4

$$x_R = \pi/4 \Rightarrow x = \pi/4, x = 3\pi/4, x = 5\pi/4, x = 7\pi/4$$

$$\Rightarrow \boxed{\{\pi/4, 3\pi/4, 5\pi/4, 7\pi/4\}}$$



$$\textcircled{3} \tan^2(x) + \sqrt{3} \tan(x) = 0$$

$$\Rightarrow \tan(x) (\tan(x) + \sqrt{3}) = 0$$

$$\Rightarrow \tan(x) = 0 \quad \text{or} \quad \tan(x) + \sqrt{3} = 0$$

$$\Rightarrow x = 0 \quad \text{or} \quad x = \pi$$

$$\tan(x) = -\sqrt{3}$$

Quad. chk Q II Q III

$$x_R = \pi/3 \Rightarrow x = 2\pi/3, x = 5\pi/3$$

$$\Rightarrow \boxed{\{0, \pi, 2\pi/3, 5\pi/3\}}$$

$$(4) (\tan^2 - 3)(2\cos(x) + 1) = 0$$

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

$$\Rightarrow \tan(x) = \pm\sqrt{3} \text{ or } \cos(x) = -1/2$$

Quad check

All 4

$$x = \pi/3 \Rightarrow x = 2\pi/3$$

$$x = 4\pi/3$$

$$x_1 = \pi/3 \quad x = 2\pi/3 \quad x = 4\pi/3 \quad x = 5\pi/3$$

$$\boxed{\left\{ \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3} \right\}}$$

$$(5) 6\tan^2(x) - 2 = 0$$

$$\Rightarrow 6\tan^2(x) = 2$$

$$\Rightarrow \tan^2(x) = 2/6 = 1/3$$

$$\Rightarrow \tan(x) = \pm\sqrt{1/3} = \pm\frac{1}{\sqrt{3}}$$

Quad check all 4

$$x_1 = \pi/6 \quad x = \pi/6 \quad x = 5\pi/6 \quad x = 7\pi/6 \quad x = 11\pi/6$$

$$\boxed{\left\{ \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6} \right\}}$$

$$(6) \tan^3(x) - \tan(x) = 0$$

$$\Rightarrow \tan(x)(\tan^2(x) - 1) = 0$$

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

$$\Rightarrow x = 0, x = \pi \quad \tan^2(x) = 1$$

$$\tan(x) = \pm\sqrt{1} = \pm 1$$

Quad check all 4

$$x_1 = \pi/4$$

$$x = \pi/4 \quad x = 3\pi/4 \quad x = 5\pi/4 \quad x = 7\pi/4$$