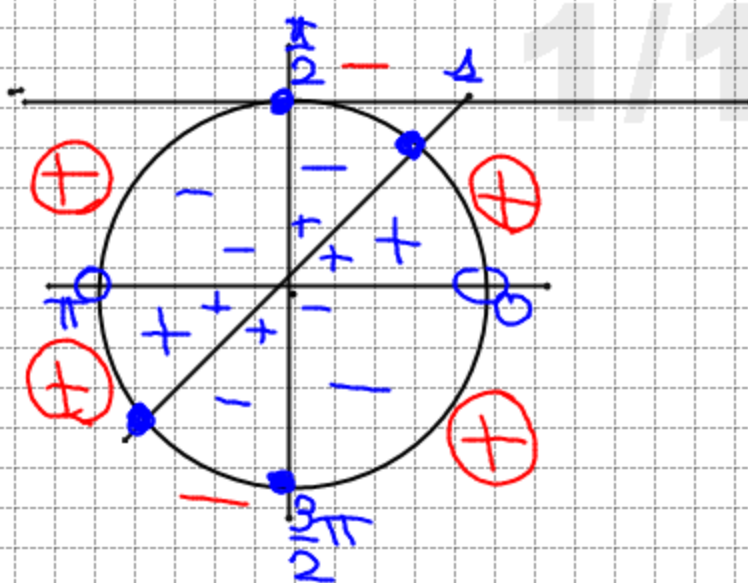


$$\operatorname{ctg}^2 \frac{x}{2} - \operatorname{ctg} \frac{x}{2} \geq 0$$

$$\operatorname{ctg} \frac{x}{2} (\operatorname{ctg} \frac{x}{2} - 1) \geq 0$$

$$\Rightarrow \operatorname{ctg} \frac{x}{2} \geq 0$$

$$\Rightarrow \operatorname{ctg} \frac{x}{2} \geq 1$$



$$0 + k\pi < \frac{x}{2} \leq \frac{\pi}{4} + k\pi \quad k \in \mathbb{N}$$

$$-\frac{\pi}{2} + k\pi \leq \frac{x}{2} \leq \frac{\pi}{4} + k\pi \quad \cup$$

$$\frac{\pi}{2} + k\pi < \frac{x}{2} < \pi + k\pi \quad k \in \mathbb{N}$$

$$k \in \mathbb{N} \quad \frac{x}{2} \neq 0 + k\pi \quad x \neq 2k\pi$$

$$2k\pi < x < \frac{\pi}{2} + 2k\pi \quad k \in \mathbb{N}$$

$$-\pi + 2k\pi \leq x \leq \frac{\pi}{2} + 2k\pi$$

$$\pi + 2k\pi < x < 2\pi + 2k\pi \quad k \in \mathbb{N}$$

$$\cup$$

$$x \neq 2k\pi \quad k \in \mathbb{N}$$

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$$\operatorname{sen} x + \operatorname{sen} 3x + \operatorname{sen} 5x = 0$$

PROSTAFERES:

$$\operatorname{sen} 3x + \operatorname{sen} 5x = 2 \operatorname{sen} \frac{3x+5x}{2} \cos \frac{5x-3x}{2} =$$

$$\operatorname{sen} x + 2 \operatorname{sen} 4x \cos x = 0$$

$$\operatorname{sen} x + 4 \operatorname{sen} 2x \cos 2x \cos x = 0$$

$$\operatorname{sen} x + 4 (2 \operatorname{sen} x \cos x) (\cos^2 x - \operatorname{sen}^2 x) \cos x = 0$$

$$\operatorname{sen} x + 8 \operatorname{sen} x \cos^2 x (\cos^2 x - \operatorname{sen}^2 x) = 0$$

$$\operatorname{sen} x + 8 \operatorname{sen} x \cos^4 x - 8 \operatorname{sen}^3 x \cos^2 x = 0$$

$$\operatorname{sen} x (\Delta + 8 \cos^4 x - 8 \operatorname{sen}^2 x \cos^2 x) = 0$$

$$\operatorname{sen} x (\Delta + 8 \cos^4 x - 8 \cos^2 x + 8 \cos^4 x) = 0$$

$$\operatorname{sen} x (16 \cos^4 x - 8 \cos^2 x + 1) = 0$$

$$\operatorname{sen} x (4 \cos^2 x - 1)^2 = 0$$

$$\operatorname{sen} x = 0 \quad x = 0 + k\pi \quad k \in \mathbb{N}$$

$$4 \cos^2 x - 1 = 0$$

$$\cos^2 x = \frac{1}{4}$$

$$\cos x = \pm \frac{1}{2}$$

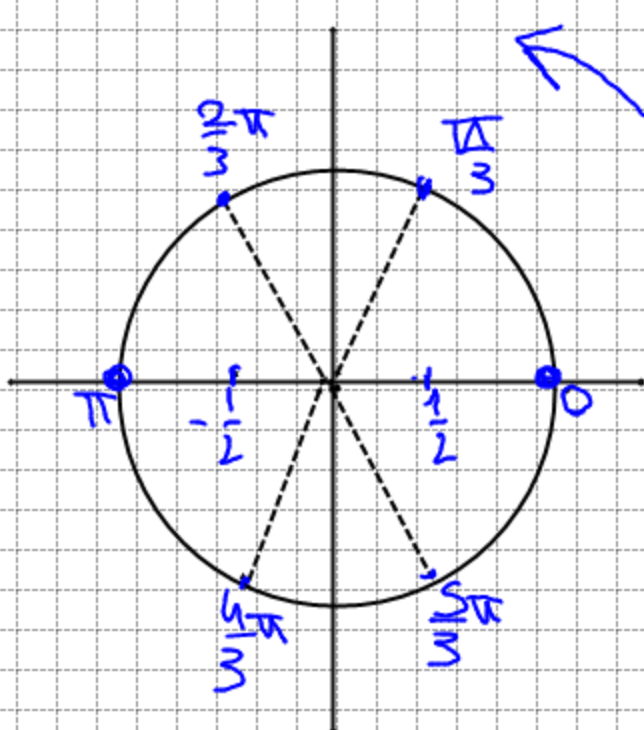
$$\cos x = \frac{1}{2} \Rightarrow x = \frac{\pi}{3} + 2k\pi \quad k \in \mathbb{N}$$

$$x = \frac{5\pi}{3} + 2k\pi \quad k \in \mathbb{N}$$

$$\cos x = -\frac{1}{2} \Rightarrow$$

$$x = \frac{2\pi}{3} + 2k\pi \quad k \in \mathbb{N}$$

$$x = \frac{4\pi}{3} + 2k\pi \quad k \in \mathbb{N}$$



$$S: x = 0 + k\pi \quad k \in \mathbb{N}, \quad x = \frac{\pi}{3} + k\pi \quad k \in \mathbb{N}$$

$$x = \frac{2\pi}{3} + k\pi \quad k \in \mathbb{N}$$