



$$\sin x = \sin\left(\frac{-f}{4}\right) \quad \sin x = \frac{-\sqrt{2}}{2} : \quad 2 \sin x + \sqrt{2} = 0$$

$$x = f - \left(\frac{-f}{4}\right) + 2kf / k \in \mathbb{Z} \quad x = \frac{-f}{4} + 2kf / k \in \mathbb{Z} :$$

$$S = \left\{ \frac{-f}{4} + 2kf / k \in \mathbb{Z} \right\} \cup \left\{ \frac{5f}{4} + 2kf / k \in \mathbb{Z} \right\} :$$

$$\cos x = \cos\left(\frac{2f}{3}\right) : \quad \cos x = \frac{-1}{2} : \quad 2 \cos x + 1 = 0$$

$$x = \frac{-2f}{3} + 2kf / k \in \mathbb{Z} \quad x = \frac{2f}{3} + 2kf / k \in \mathbb{Z} :$$

$$S = \left\{ \frac{2f}{3} + 2kf / k \in \mathbb{Z} \right\} \cup \left\{ \frac{-2f}{3} + 2kf / k \in \mathbb{Z} \right\} :$$

$$\cos\left(2x - \frac{f}{3}\right) = \cos\left(\frac{f}{4}\right) : \quad \cos\left(2x - \frac{f}{3}\right) = \frac{\sqrt{2}}{2}$$

$$2x - \frac{f}{3} = \frac{-f}{4} + 2kf / k \in \mathbb{Z} \quad 2x - \frac{f}{3} = \frac{f}{4} + 2kf / k \in \mathbb{Z} :$$

$$2x = \frac{-f}{4} + \frac{f}{3} + 2kf / k \in \mathbb{Z} \quad 2x = \frac{f}{4} + \frac{f}{3} + 2kf / k \in \mathbb{Z} :$$

$$2x = \frac{f}{12} + 2kf / k \in \mathbb{Z} \quad 2x = \frac{7f}{12} + 2kf / k \in \mathbb{Z} :$$

$$x = \frac{f}{24} + kf / k \in \mathbb{Z} \quad x = \frac{7f}{24} + kf / k \in \mathbb{Z} :$$

$$S = \left\{ \frac{f}{24} + kf / k \in \mathbb{Z} \right\} \cup \left\{ \frac{7f}{24} + kf / k \in \mathbb{Z} \right\} :$$

$$\sin\left(3x - \frac{2f}{3}\right) = \frac{\sqrt{3}}{2} = \sin\left(\frac{f}{3}\right) : \quad 2 \sin\left(3x - \frac{2f}{3}\right) = \sqrt{3}$$

$$3x - \frac{2f}{3} = f - \frac{f}{3} + 2kf / k \in \mathbb{Z} \quad 3x - \frac{2f}{3} = \frac{f}{3} + 2kf / k \in \mathbb{Z} :$$

$$3x = \frac{2f}{3} + \frac{2f}{3} + 2kf / k \in \mathbb{Z} \quad 3x = \frac{f}{3} + \frac{2f}{3} + 2kf / k \in \mathbb{Z} :$$

$$3x = \frac{4f}{3} + 2kf / k \in \mathbb{Z} \quad 3x = f + 2kf / k \in \mathbb{Z} :$$

$$x = \frac{4f}{9} + \frac{2kf}{3} / k \in \mathbb{Z} \quad x = \frac{f}{3} + \frac{2kf}{3} / k \in \mathbb{Z} :$$

$$S = \left\{ \frac{f}{3} + \frac{2kf}{3} / k \in \mathbb{Z} \right\} \cup \left\{ \frac{4f}{9} + \frac{2kf}{3} / k \in \mathbb{Z} \right\} :$$

$$a = f - b + 2kf / k \in \mathbb{Z} \quad a = b + 2kf / k \in \mathbb{Z} : \quad \sin(a) = \sin(b) : \quad \sin(a) = \sin(b) :$$

$$a = -b + 2kf / k \in \mathbb{Z} \quad a = b + 2kf / k \in \mathbb{Z} : \quad \cos(a) = \cos(b) : \quad \cos(a) = \cos(b) :$$

$$\sin\left(5x - \frac{f}{3}\right) = \sin\left(x + \frac{f}{3}\right) :$$

$$5x - \frac{f}{3} = f - \left(x + \frac{f}{3}\right) + 2kf / k \in \mathbb{Z} \quad 5x - \frac{f}{3} = x + \frac{f}{3} + 2kf / k \in \mathbb{Z}$$

$$5x - \frac{f}{3} = f - x - \frac{f}{3} + 2kf / k \in \mathbb{Z} \quad 5x - x = \frac{f}{3} + \frac{f}{3} + 2kf / k \in \mathbb{Z}$$

$$6x = f + 2kf / k \in \mathbb{Z} \quad 4x = \frac{2f}{3} + 2kf / k \in \mathbb{Z}$$

$$x = \frac{f}{6} + \frac{kf}{3} / k \in \mathbb{Z} \quad x = \frac{f}{6} + \frac{kf}{2} / k \in \mathbb{Z}$$

$$S = \left\{ \frac{f}{6} + \frac{kf}{2} / k \in \mathbb{Z} \right\} \cup \left\{ \frac{f}{6} + \frac{kf}{3} / k \in \mathbb{Z} \right\} :$$

$$\cos\left(\frac{f}{2} - x\right) = \cos x : \quad \sin x = \cos x :$$

$$\frac{f}{2} - x = -x + 2kf / k \in \mathbb{Z} \quad \frac{f}{2} - x = x + 2kf / k \in \mathbb{Z}$$

$$\frac{f}{2} = 2kf / k \in \mathbb{Z} \quad -2x = \frac{-f}{2} + 2kf / k \in \mathbb{Z}$$

$$\left(\frac{1}{2} = 0,5 \text{ متساوية غير ممكنة لأن } 2k \text{ عدد صحيح}\right) \frac{1}{2} = 2k / k \in \mathbb{Z} \quad x = \frac{f}{4} - kf / k \in \mathbb{Z}$$

$$S = \left\{ \frac{f}{4} - kf / k \in \mathbb{Z} \right\} :$$

$$\cos(3x) = 0 \quad \sin x - 1 = 0 : \quad \cos(3x) \cdot (\sin x - 1) = 0 :$$

$$\text{(استعملنا الدائرة المثلثية)} \quad 3x = 2kf / k \in \mathbb{Z} \quad x = \frac{f}{2} + 2kf / k \in \mathbb{Z} : \quad \cos(3x) = 0 \quad \sin x = 1 :$$

$$x = \frac{2kf}{3} / k \in \mathbb{Z} \quad x = \frac{f}{2} + 2kf / k \in \mathbb{Z} :$$

$$S = \left\{ \frac{f}{2} + 2kf / k \in \mathbb{Z} \right\} \cup \left\{ \frac{2kf}{3} / k \in \mathbb{Z} \right\} :$$

$$\sin x \left(2 + \frac{1}{\cos x} \right) = 0 : \quad 2 \sin x + \frac{\sin x}{\cos x} = 0 : \quad 2 \sin x + \tan x = 0 :$$

$$\frac{1}{\cos x} = -2 \quad \sin x = 0 : \quad 2 + \frac{1}{\cos x} = 0 \quad \sin x = 0 :$$

$$\cos x = \cos \left(\frac{2f}{3} \right) \quad \sin x = 0 : \quad \cos x = \frac{-1}{2} \quad \sin x = 0 :$$

$$x = -\frac{2f}{3} + 2kf / k \in \mathbb{Z} \quad x = \frac{2f}{3} + 2kf / k \in \mathbb{Z} \quad x = kf / k \in \mathbb{Z}$$

$$S = \{kf / k \in \mathbb{Z}\} \cup \left\{ \frac{2f}{3} + 2kf / k \in \mathbb{Z} \right\} \cup \left\{ -\frac{2f}{3} + 2kf / k \in \mathbb{Z} \right\} :$$

$$\cos \left(\frac{f}{2} - x \right) = \cos x : \quad \sin x = \cos x :$$

$$\frac{f}{2} - x = -x + 2kf / k \in \mathbb{Z} \quad \frac{f}{2} - x = x + 2kf / k \in \mathbb{Z}$$

$$\frac{f}{2} = 2kf / k \in \mathbb{Z} \quad -2x = \frac{-f}{2} + 2kf / k \in \mathbb{Z}$$

$$\left(\frac{1}{2} = 0,5 \text{ و } \frac{1}{2} = 2k / k \in \mathbb{Z} \text{ (متساوية غير ممكنة لأن } 2k \text{ عدد صحيح و } \frac{1}{2} = 0,5) \right) \quad x = \frac{f}{4} - kf / k \in \mathbb{Z}$$

$$S = \left\{ \frac{f}{4} - kf / k \in \mathbb{Z} \right\} :$$

$$\cos \left(\frac{f}{2} - \left(x + \frac{f}{6} \right) \right) = \cos \left(2x + \frac{f}{3} \right) : \quad \sin \left(x + \frac{f}{6} \right) = \cos \left(2x + \frac{f}{3} \right) :$$

$$\cos \left(\frac{f}{3} - x \right) = \cos \left(2x + \frac{f}{3} \right) : \quad \cos \left(\frac{f}{2} - x - \frac{f}{6} \right) = \cos \left(2x + \frac{f}{3} \right) :$$

$$\frac{f}{3} - x = -\left(2x + \frac{f}{3} \right) + 2kf / k \in \mathbb{Z} \quad \frac{f}{3} - x = 2x + \frac{f}{3} + 2kf / k \in \mathbb{Z} :$$

$$\frac{f}{3} - x = -2x - \frac{f}{3} + 2kf / k \in \mathbb{Z} \quad -3x = 2kf / k \in \mathbb{Z} :$$

$$x = -\frac{2f}{3} + 2kf / k \in \mathbb{Z} \quad x = \frac{-2kf}{3} / k \in \mathbb{Z} :$$

$$S = \left\{ \frac{-2kf}{3} / k \in \mathbb{Z} \right\} \cup \left\{ -\frac{2f}{3} + 2kf / k \in \mathbb{Z} \right\} :$$

: نطبق القواعد السابقة حتى وإن كانت التعابير (داخل النسب المثلثية) مركبة. 

$$\sin x + 2 = 0 \quad \sin x - 2 = 0 : \quad (\sin x - 2)(\sin x + 2) = 0 : \quad \sin^2 x - 4 = 0 :$$

$$-1 \leq \sin x \leq 1 \quad \text{و هذا غير ممكن في الحالتين لأننا نعلم أن:} \quad \sin x = -2 \quad \sin x = 2 :$$

$$S = \emptyset :$$

$$(\sqrt{3} \tan x - 1)(\sqrt{3} \tan x + 1) = 0 : \quad 3 \tan^2(x) - 1 = 0 :$$

$$\tan x = \frac{-\sqrt{3}}{3} \quad \tan x = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

$$x = -\frac{f}{6} + kf / k \in Z \quad x = \frac{f}{6} + kf / k \in Z : \quad \tan x = \tan\left(-\frac{f}{6}\right) \quad \tan x = \tan\left(\frac{f}{6}\right)$$

$$S = \left\{ \frac{f}{6} + kf / k \in Z \right\} \cup \left\{ -\frac{f}{6} + kf / k \in Z \right\} :$$

$$(\sqrt{2} \cos x - 1)(\sqrt{2} \cos x + 1) = 0 : \quad 4 \cos^2 x - 1 = 0 :$$

$$\cos x = \cos\left(\frac{3f}{4}\right) \quad \cos x = \cos\left(\frac{f}{4}\right) : \quad \cos x = \frac{-\sqrt{2}}{2} \quad \cos x = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2} :$$

$$x = -\frac{3f}{4} + 2kf / k \in Z \quad x = \frac{3f}{4} + 2kf / k \in Z \quad x = -\frac{f}{4} + 2kf / k \in Z \quad x = \frac{f}{4} + 2kf / k \in Z$$

$$S = \left\{ \frac{f}{4} + 2kf / k \in Z \right\} \cup \left\{ -\frac{f}{4} + 2kf / k \in Z \right\} \cup \left\{ \frac{3f}{4} + 2kf / k \in Z \right\} \cup \left\{ -\frac{3f}{4} + 2kf / k \in Z \right\} :$$