

الف) $1 - 2\sin^2 x = 2\sin x - 1 \rightarrow 2\sin^2 x + 2\sin x - 2 = 0 \rightarrow \sin x \leftarrow \frac{1}{2} \checkmark$ ①
 $\sin x = \sin \frac{\pi}{6} \rightarrow x = 2k\pi + \frac{\pi}{6}, x = 2k\pi + \frac{5\pi}{6}$
 ب) $2\cos^2 x - 1 + \cos x - 2 = 0 \rightarrow 2\cos^2 x + \cos x - 2 = 0 \rightarrow \cos x \leftarrow \frac{-1}{2} \checkmark$
 $\cos x = \cos(\pi) \rightarrow x = 2k\pi \pm \pi \rightarrow x = 2k\pi$

الف) $-\cos 2x = 2\sin x \cos x \rightarrow \sin 2x = -\frac{1}{2} \rightarrow \sin 2x = \sin(-\frac{\pi}{6}) \rightarrow x = k\pi - \frac{\pi}{12}$ ②
 $x = k\pi - \frac{\pi}{12}$
 ب) $2\cos^2 x - 1 + 2\sin x \cos x = \cos 2x + \sin 2x = 0 \xrightarrow{\div \cos x} 1 + \tan 2x = 0 \rightarrow \tan 2x = -1$
 $\rightarrow \tan 2x = \tan(-\frac{\pi}{4}) \rightarrow 2x = k\pi - \frac{\pi}{4} \rightarrow x = \frac{k\pi}{2} - \frac{\pi}{8}$

الف) $\frac{2\sin^2 x}{\sin x} \rightarrow \sin x \cdot \frac{\cos x}{\sin x} (2\cos x + 1) = \sin x \cdot \frac{1}{\sin x} \rightarrow \cos x (2\cos x + 1) = 1$ ③
 $\rightarrow 2\cos^2 x + \cos x - 1 = 0$
 $\begin{cases} \cos x = 1 \text{ (مردود است)} \\ \cos x = -\frac{1}{2} \checkmark \rightarrow \cos x = \cos \frac{2\pi}{3} \rightarrow x = 2k\pi \pm \frac{2\pi}{3} \end{cases}$
 ب) $\sin^2 x + \sin^2 x + \cos^2 x - \sin x \cos x = 2 \rightarrow \sin^2 x - \sin x \cos x = 1 \rightarrow -\sin x \cos x = 1 - \sin^2 x$
 $\rightarrow -\sin x \cos x = \cos^2 x \rightarrow \cos x = -\sin x \rightarrow \tan x = -1 \rightarrow \tan x = \tan(-\frac{\pi}{4}) \rightarrow x = k\pi - \frac{\pi}{4}$

الف) $\cos(\frac{\pi}{6} + x) \cos(x - \frac{\pi}{6}) = \frac{1}{2} \xrightarrow{\text{فرمول جمع}} \cos(\frac{\pi}{6} + x) \cos(\frac{\pi}{6} + x) = \frac{1}{2} \cos 2x = \frac{1}{2}$ ④
 $\cos 2x = \frac{1}{2} \rightarrow \cos 2x = \cos \frac{\pi}{3} \rightarrow 2x = 2k\pi \pm \frac{\pi}{3} \rightarrow x = k\pi \pm \frac{\pi}{6}$
 ب) $-\sin 2x = \cos(\frac{\pi}{6} + x) \rightarrow \cos(\pi - \frac{\pi}{6}) = \cos(\frac{\pi}{6} + x) \rightarrow \pi - \frac{\pi}{6} = \frac{\pi}{6} + x + 2k\pi$
 $\pi - \frac{\pi}{6} = \frac{\pi}{6} + x + 2k\pi \rightarrow \pi - \frac{\pi}{6} - \frac{\pi}{6} = x + 2k\pi$
 $\rightarrow x = \frac{4\pi}{3} - \frac{\pi}{6} + 2k\pi$

الف) $\frac{\sin 2x (2\cos 2x + 1)}{\sin 2x} - \sin^2 x = \cos^2 x \rightarrow 2\cos 2x + 1 = 1 \rightarrow 2\cos 2x = 0 \rightarrow \cos 2x = 0 \rightarrow 2x = k\pi + \frac{\pi}{2}$ ⑤
 $\rightarrow x = k\pi \pm \frac{\pi}{4}$

$$\frac{\sin \frac{x}{r}}{1 + \cos \frac{x}{r}} = \frac{1}{\sin \frac{x}{r}} + \frac{\cos \frac{x}{r}}{\sin \frac{x}{r}} \rightarrow \frac{\sin \frac{x}{r}}{1 + \cos \frac{x}{r}} = \frac{1 + \cos \frac{x}{r}}{\sin \frac{x}{r}} \rightarrow \sin^2 \left(\frac{x}{r} \right) = (1 + \cos \frac{x}{r})^2$$

$$\rightarrow 1 - \cos^2 \frac{x}{r} = (1 + \cos \frac{x}{r})^2 \rightarrow 2 \cos^2 \frac{x}{r} + 2 \cos \frac{x}{r} = 0 \rightarrow \cos \frac{x}{r} = 0 \vee \cos \frac{x}{r} = -1 \times$$

$$\cos \frac{x}{r} = \cos \left(\frac{\pi}{r} \right) \rightarrow \frac{x}{r} = 2k\pi \pm \frac{\pi}{r} \rightarrow x = 2k\pi \pm \pi \rightarrow k=0 \rightarrow x = \pi, -\pi$$

$$\text{فاصله} \rightarrow |\pi - (-\pi)| = 2\pi$$

$$\frac{\cos^2 x - 1}{\sin^2 x} = \sin^2 x (\cos^2 x - 1) \rightarrow \sin^2 x (\cos^2 x + 1) = 0 \rightarrow \sin^2 x = 0 \rightarrow x = 0, \pi, 2\pi$$

$$\rightarrow \cos^2 x = -1 \rightarrow \cos^2 x = \cos(\pi)$$

$$\rightarrow x = 2k\pi \pm \pi \rightarrow x = \frac{2k\pi}{r} \pm \frac{\pi}{r} \rightarrow x = \left\{ \frac{\pi}{r}, \frac{0\pi}{r}, \pi \right\} \rightarrow \left\{ 0, \frac{\pi}{r}, \pi, \frac{0\pi}{r}, \pi \right\}$$

$$\frac{1 - \tan x}{1 + \tan x} = \tan \left(\frac{\pi}{2} - x \right) \rightarrow \tan \left(\frac{\pi}{2} - x \right) = \tan r\pi \rightarrow \frac{\pi}{2} - x = k\pi + \frac{\pi}{2} \rightarrow x = \frac{\pi}{2} - \frac{k\pi}{2}$$

$$\text{رابطه} \quad 1 + \sin^2 x = 2 \cos^2 x \rightarrow \sin^2 x = (2 \cos^2 x - 1) \rightarrow 1 - \sin^2 x = \sin^2 x$$

$$\rightarrow 2 \sin^2 x + \sin^2 x - 1 = 0 \rightarrow \sin^2 x = -1 \rightarrow x = \frac{\pi}{2} \rightarrow \cos x = 0 \vee x = \frac{3\pi}{2}$$

$$\sin^2 x = \frac{1}{4} \rightarrow x = \frac{\pi}{4} \xrightarrow{\text{بدر}} \cos x > 0 \vee x = \frac{\pi}{4}$$

$$x = \frac{0\pi}{4} \xrightarrow{\text{بدر}} \cos x < 0 \times$$

الف)  $\rightarrow x = k\pi + \frac{\pi}{r}$
 $\rightarrow x = \left\{ \frac{\pi}{r}, \frac{3\pi}{r} \right\}$

ب)  $\begin{cases} x = 2k\pi \\ x = 2k\pi - \frac{\pi}{r} \end{cases}$
 $x = \left\{ 0, \frac{\pi}{r}, \pi \right\}$