

الف) $\cos 2x = 2\sin x - 1$

$\sin x = \frac{1 - \cos 2x}{2} \Rightarrow \cos 2x = 1 - 2\sin^2 x$ $\Rightarrow \frac{-2 \pm \sqrt{4 - 4}}{2 \times 2} \Rightarrow \frac{-2}{4} \Rightarrow \frac{-1}{2} \Rightarrow \sin x$

$\sin(x) = \frac{1}{2}$ $\Rightarrow x = 2k\pi + \frac{\pi}{6}, x = 2k\pi + \pi - \frac{\pi}{6} \Rightarrow x = 2k\pi + \frac{5\pi}{6}$

ب) $\cos 2x + \cos x = 2$ $\xrightarrow{\cos 2x = 2\cos^2 x - 1}$ $2\cos^2 x + \cos x - 2 = 0$ $\begin{cases} \cos x = \frac{3}{2} \\ \cos x = -1 \end{cases}$
 $\cos x = -1 \Rightarrow x = 2k\pi$

الف) $(\sin^2 x + \cos^2 x)(\sin^2 x - \cos^2 x) = \sin 2x \Rightarrow \cos 2x = \cos(\frac{\pi}{2} - 2x)$
 $-\cos 2x = \cos 2x$

ب) $2\cos^2 x - 1 = -2\sin x \cdot \cos x$
 $\cos 2x = -\sin(2x) \Rightarrow \cos 2x = \sin(\frac{\pi}{2} - 2x)$
 $2x = k\pi + \frac{\pi}{2} - 2x \Rightarrow x = \frac{k\pi}{4} + \frac{\pi}{4}$
 $2x = k\pi - \frac{\pi}{2} + 2x \Rightarrow x = -\frac{k\pi}{2} + \frac{\pi}{4}$

$x \begin{cases} 2x = k\pi + \frac{\pi}{2} - 2x \\ 2x = k\pi - \frac{\pi}{2} + 2x \end{cases} \Rightarrow \begin{cases} 4x = k\pi + \frac{\pi}{2} \\ 4x = k\pi - \frac{\pi}{2} \end{cases} \Rightarrow \begin{cases} x = \frac{k\pi}{4} + \frac{\pi}{8} \\ x = \frac{k\pi}{4} - \frac{\pi}{8} \end{cases}$

الف) $\frac{\cos x}{\sin x} \cdot (2\cos x + 1) = \frac{1}{\sin x} \Rightarrow 2\cos^2 x + \cos x - 1 = 0$ $\begin{cases} \cos x = -1 \\ \cos x = \frac{1}{2} \end{cases}$
 $x = 2k\pi + \pi, x = k\pi \pm \frac{\pi}{3}$

ب) $2\sin^2 x - \sin x \cdot \cos x + \cos^2 x = 2\sin^2 x + x \cos^2 x \Rightarrow \sin x = \cos x \Rightarrow \cos(\frac{\pi}{2} - x) = \cos x$
 $x = 2k\pi + \frac{\pi}{2} - x \Rightarrow x = k\pi + \frac{\pi}{4}$
 $x = 2k\pi + x - \frac{\pi}{2} \Rightarrow x = k\pi + \frac{\pi}{4}$

الف) $\begin{cases} \cos(x + \frac{\pi}{2}) \cdot \cos^2(x - \frac{\pi}{2}) \\ \sin(x - \frac{\pi}{2}) \cdot \cos(x - \frac{\pi}{2}) = -\frac{1}{2} \end{cases}$ $\begin{cases} \sin(2x - \frac{\pi}{2}) = -\frac{1}{2} \\ 2x - \frac{\pi}{2} = 2k\pi - \frac{\pi}{6} \\ 2x - \frac{\pi}{2} = 2k\pi + \pi - \frac{\pi}{6} \end{cases} \Rightarrow \begin{cases} x = k\pi + \frac{\pi}{6} \\ x = k\pi + \frac{5\pi}{6} \end{cases}$

ب) $\cos(2x - \frac{\pi}{4}) = \cos(\frac{\pi}{4} - 2x)$
 $2x - \frac{\pi}{4} = 2k\pi + \frac{\pi}{4} - 2x \Rightarrow 4x = 2k\pi + \frac{\pi}{2} \Rightarrow x = \frac{k\pi}{2} + \frac{\pi}{4}$
 $2x - \frac{\pi}{4} = 2k\pi + 2x - \frac{\pi}{4}$

$\Rightarrow \frac{2\sin^2 x \cdot \cos^2 x + \sin^2 x}{\sin 2x} = \frac{\sin^2 x}{\sin 2x} + \frac{\cos^2 x}{\sin 2x} \Rightarrow \frac{\sin^2 x (2\cos^2 x + 1)}{\sin 2x} = 1$
 $2\cos^2 x + 1 = \frac{2}{\sin 2x} \Rightarrow \cos^2 x = 0 \Rightarrow 2x = k\pi + \frac{\pi}{2}$
 $\Rightarrow x = \frac{k\pi}{2} + \frac{\pi}{4}$

$$\frac{\sin x}{1 + \cos x} = \frac{1 + \cos x}{\sin x} \Rightarrow \frac{\sin^2 x}{1 - \cos^2 x} = \cos^2 x + \cos x \cdot \frac{1}{1} \Rightarrow \frac{\sin^2 x}{1 - \cos^2 x} = \cos^2 x + \cos x$$

$$\Rightarrow \frac{\sin^2 x}{1 - \cos^2 x} = \cos x (\cos x + 1)$$

$\Rightarrow x = k\pi \pm \frac{\pi}{2}$
 $k=1 \Rightarrow \pi + \frac{\pi}{2} = \frac{3\pi}{2}$
 $k=0 \Rightarrow 0 - \frac{\pi}{2} = -\frac{\pi}{2}$
 $\frac{3\pi}{2} - \frac{-\pi}{2} = \frac{4\pi}{2} = \frac{2\pi}{1}$

$$\cos^2 x = 1 - \sin^2 x \Rightarrow 1 - \sin^2 x - \sin^2 x \cdot \cos^2 x \Rightarrow \sin^2 x + \sin^2 x \cdot \cos^2 x = 1$$

$$\sin^2 x (1 + \cos^2 x) = 1$$

$\sin^2 x = 0 \Rightarrow x = k\pi$
 $\cos^2 x = -1 \Rightarrow x = k\pi + \pi$
 $\Rightarrow x = \frac{k\pi}{2} + \frac{\pi}{2}$

$$\frac{1 - \tan x}{1 + \tan x} = \tan\left(\frac{\pi}{4} - x\right) \Rightarrow \tan(x) = \tan\left(\frac{\pi}{4} - x\right)$$

$$\Rightarrow x = k\pi + \frac{\pi}{4} - x$$

$$\Rightarrow 2x = k\pi + \frac{\pi}{4}$$

$$\Rightarrow x = \frac{k\pi}{2} + \frac{\pi}{8}$$

$$\Rightarrow 1 + \sin^2 x = \cos^2 x \Rightarrow \sin^2 x = \cos^2 x - 1$$

$$\Rightarrow \cos\left(\frac{\pi}{2} - x\right) = \cos(x) \Rightarrow x = k\pi + \frac{\pi}{2} - x$$

$$\Rightarrow x = \frac{k\pi}{2} + \frac{\pi}{4}$$

$$x = k\pi - \frac{\pi}{4}$$

ا) $\sin^2 x - \cos^2 x = 1$

$$x \rightarrow k\pi + \frac{\pi}{2}$$

ب) $\sin^2 x - \cos^2 x = -1$

$$x \rightarrow k\pi$$

$$x \rightarrow k\pi - \frac{\pi}{2}$$

