**Question 27**

Solve each of the following trigonometric equations.

**a)** $\sin\left(\theta+\frac{\pi}{4}\right)=\sin\theta\,, \qquad 0\le\theta<2\pi$

**b)** $\cos\left(x+\frac{\pi}{6}\right)=\cos\left(x+\frac{2\pi}{3}\right), \qquad 0\le\theta<2\pi$

**c)** $\sin\left(\frac{\pi}{3}-y\right)=\cos\left(y+\frac{5\pi}{6}\right), \qquad 0\le y<2\pi$ (very hard)

**d)** $2\cos\left(\varphi+\frac{\pi}{2}\right)+\sin\left(\varphi+\frac{\pi}{3}\right)=0\,, \qquad 0\le\varphi<2\pi$

**e)** $\sqrt{2}\cos\left(\alpha+\frac{\pi}{4}\right)=\sin\left(\alpha+\frac{\pi}{6}\right), \qquad 0\le\alpha<2\pi$

$$\boxed{\theta=\frac{3\pi}{8},\ \frac{11\pi}{8}}\,,\quad \boxed{x=\frac{7\pi}{12},\ \frac{19\pi}{12}}\,,\quad \boxed{y=\frac{\pi}{2},\ \frac{3\pi}{2}}\,,\quad \boxed{\varphi=\frac{\pi}{6},\ \frac{7\pi}{6}}\,,\quad \boxed{\alpha=\frac{\pi}{12},\ \frac{13\pi}{12}}$$