



$$1) \sin \theta = \frac{3}{5}$$

$$2) \tan \theta = \frac{3}{4}$$

$$3) \cos 2\theta = 2\cos^2\theta - 1 = 2\left(\frac{4}{5}\right)^2 - 1$$

$$= \frac{32}{25} - \frac{25}{25}$$

$$= \frac{7}{25}$$

$$4) \sin 2\theta = 2\left(\frac{3}{5}\right)\left(\frac{4}{5}\right)$$

$$= \frac{24}{25}$$

$$5) \tan 2\theta = \frac{24}{7}$$

$$6) \sec 2\theta = \frac{25}{7}$$

$$7) \csc 2\theta = \frac{25}{24}$$

$$8) \cot 2\theta = \frac{7}{24}$$

$$9) \sin 2x - \sin x = 0$$

$$2\sin x \cos x - \sin x = 0$$

$$\sin x (2\cos x - 1) = 0$$

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

$$\left\{ 0, \pi, \frac{\pi}{3}, \frac{5\pi}{3} \right\}$$

$$10) \sin 2x + \cos x = 0$$

$$2\sin x \cos x + \cos x = 0$$

$$\cos x (2\sin x + 1) = 0$$

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

$$\left\{ \frac{\pi}{2}, \frac{3\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6} \right\}$$

$$11) 4\sin x \cos x = 1$$

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

$$\sin 2x = \frac{1}{2}$$

$$2x = \frac{\pi}{6} + 2\pi n, \frac{5\pi}{6} + 2\pi n, n \in \mathbb{Z}$$

$$\left\{ \frac{\pi}{12}, \frac{13\pi}{12}, \frac{5\pi}{12}, \frac{17\pi}{12} \right\}$$

$$12) \sin 2x \sin x = \cos x$$

$$2\sin^2 x \cos x - \cos x = 0$$

$$\cos x (2\sin^2 x - 1) = 0$$

$$\cos x = 0 \quad \sin x = \pm \frac{1}{\sqrt{2}}$$

$$\left\{ \frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4} \right\}$$

$$13) \cos 2x - \cos x = 0$$

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

$$(2\cos x + 1)(\cos x - 1) = 0$$

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

$$\left\{ 0, \frac{2\pi}{3}, \frac{4\pi}{3} \right\}$$

$$14) \cos 2x + \sin x = 0$$

$$1 + \sin x - 2\sin^2 x = 0$$

$$(1 + 2\sin x)(1 - \sin x) = 0$$

$$\sin x = -\frac{1}{2} \quad \sin x = 1$$

$$\left\{ \frac{\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6} \right\}$$

$$15) \tan 2x - \cot x = 0$$

$$\frac{\sin 2x}{\cos 2x} - \frac{\cos x}{\sin x} = 0$$

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

$$\frac{4\sin^2 x \cos x - \cos x}{\sin x \cos 2x} = 0$$

$$\frac{\cos x (4\sin^2 x - 1)}{\sin x \cos 2x}$$

$$\cos x = 0 \quad \sin x = \pm \frac{1}{2}$$

$$\text{domain } \mathbb{R} \setminus \left\{ 0 + \pi n, \frac{\pi}{4} + \frac{\pi}{2} n, n \in \mathbb{Z} \right\}$$

$$\left\{ \frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6} \right\}$$

$$16) \tan 2x - 2\cos x = 0$$

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

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

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

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

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

$$\text{domain } \mathbb{R} \setminus \left\{ \frac{\pi}{4} + \frac{\pi}{2} n, n \in \mathbb{Z} \right\}$$

$$\left\{ \frac{\pi}{2}, \frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2} \right\}$$

$$17) \sin 4x = -2 \sin 2x$$

$$\sin(2 \cdot 2x) + 2 \sin 2x = 0$$

$$2 \sin 2x \cos 2x + 2 \sin 2x = 0$$

$$2 \sin 2x (\cos 2x + 1) = 0$$

$$2x = 0 + \pi n \quad 2x = \pi + 2\pi n, n \in \mathbb{Z}$$

$$\left\{ 0, \frac{\pi}{2}, \pi, \frac{3\pi}{2} \right\}$$

$$18) (\sin 2x + \cos 2x)^2 = 1$$

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

$$1 + 2 \sin 2x \cos 2x = 1$$

$$2 \sin 2x \cos 2x = 0$$

$$2x = 0 + \pi n \quad \frac{\pi}{2} + \pi n, n \in \mathbb{Z}$$

$$\left\{ 0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4} \right\}$$

$$19) \begin{array}{l} 6 \sin x \cos x \\ 3 \sin 2x \end{array} \quad 20) \begin{array}{l} 4 \sin x \cos x + 2 \\ 2 \sin 2x + 2 \\ 2(\sin 2x + 1) \end{array} \quad 21) \begin{array}{l} 4 - 8 \sin^2 x \\ 4(1 - 2 \sin^2 x) \\ 4 \cos 2x \end{array} \quad 22) \begin{array}{l} (\cos x + \sin x)(\cos x - \sin x) \\ \cos^2 x - \sin^2 x \\ \cos 2x \end{array}$$

$$24) \cos u = -\frac{2}{3} \quad \frac{\pi}{2} < u < \pi$$

$$\sin 2u = 2 \left(\frac{\sqrt{5}}{3} \right) \left(-\frac{2}{3} \right) = -\frac{4\sqrt{5}}{9}$$

$$\cos 2u = 2 \left(-\frac{2}{3} \right)^2 - 1 = -\frac{1}{9}$$

$$\tan 2u = -4\sqrt{5}$$

$$26) \cot u = -4 \quad \frac{3\pi}{2} < u < 2\pi$$

$$\sin 2u = 2 \left(-\frac{1}{\sqrt{17}} \right) \left(\frac{4}{\sqrt{17}} \right) = -\frac{8}{17}$$

$$\cos 2u = 2 \left(\frac{4}{\sqrt{17}} \right)^2 - 1 = \frac{15}{17}$$

$$\tan 2u = -\frac{8}{15}$$



$$28) \csc u = 3 \quad \frac{\pi}{2} < u < \pi$$

$$\sin 2u = 2 \left(\frac{1}{3} \right) \left(-\frac{2\sqrt{2}}{3} \right) = -\frac{4\sqrt{2}}{9}$$

$$\cos 2u = 1 - 2 \left(\frac{1}{3} \right)^2 = \frac{7}{9}$$

$$\tan 2u = -\frac{4\sqrt{2}}{7}$$

