

$$\textcircled{1} \quad \tan 3x = 1$$

$$\frac{3x}{3} = \frac{\frac{\pi}{4} + \pi n}{3}$$

$$x = \frac{\pi}{12} + \frac{\pi}{3}n$$

~~$$3x = \frac{5\pi}{4} + \pi n$$~~

$$x = \frac{\pi}{12}, \frac{5\pi}{12}, \frac{9\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}, \frac{21\pi}{12}$$

$$\textcircled{2} \quad \frac{4 \cos 3x}{4} = \frac{2\sqrt{3}}{4}$$

$$\cos 3x = \frac{\sqrt{3}}{2}$$

$$\frac{3x}{3} = \frac{\frac{\pi}{6} + 2\pi n}{3}$$

$$x = \frac{\pi}{18} + \frac{2\pi}{3}n$$

$$\frac{3x}{3} = \frac{\frac{11\pi}{6} + 2\pi n}{3}$$

$$x = \frac{11\pi}{18} + \frac{2\pi}{3}n$$

$$x = \frac{\pi}{18}, \frac{13\pi}{18}, \frac{25\pi}{18}, \frac{11\pi}{18}, \frac{23\pi}{18}, \frac{35\pi}{18}$$

$$\textcircled{3} \quad 8 \sin^2 x - 2 \sin x - 3 = 0$$

$$(2 \sin x + 1)(4 \sin x - 3) = 0$$

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

$$x = \frac{7\pi}{6}, \frac{11\pi}{6}$$

$$\sin x = \frac{3}{4}$$

$$x = .8481$$

$$x = 2.2935$$

$$-24x^2$$

$$-6x^2 + 4x$$

$$8x^2 - 6x + 4x - 3$$

$$2x(4x - 3) + 1(4x - 3)$$

$$\textcircled{4} \quad 3 \tan^2 x + 5 \tan x - 4 = 0$$

$$\tan x = .5907$$

$$x = .5335, 3.6751$$

$$\tan x = -2.2573$$

$$x = -1.1538$$

$$x = 5.1294, 1.9878$$

$$\tan x = w$$

$$w = \frac{-5 \pm \sqrt{25 - 4(3)(-4)}}{6}$$

$$w = \frac{-5 \pm \sqrt{73}}{6}$$

$$\textcircled{5} \sin(110+80) = \sin(190)$$

$$\begin{aligned} \textcircled{6} \sin\left(\frac{11\pi}{6} + \frac{\pi}{4}\right) &= \sin\frac{11\pi}{6} \cos\frac{\pi}{4} + \cos\frac{11\pi}{6} \sin\frac{\pi}{4} \\ &= -\frac{1}{2} \cdot \frac{\sqrt{2}}{2} + \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{2}}{2} \\ &= \frac{-\sqrt{2} + \sqrt{6}}{4} \end{aligned}$$

$$\begin{aligned} \cos\left(\frac{11\pi}{6} + \frac{\pi}{4}\right) &= \cos\frac{11\pi}{6} \cos\frac{\pi}{4} - \sin\frac{11\pi}{6} \sin\frac{\pi}{4} \\ &= \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{2}}{2} - -\frac{1}{2} \cdot \frac{\sqrt{2}}{2} \end{aligned}$$

$$\frac{\sqrt{6} + \sqrt{2}}{4}$$

$$\tan\left(\frac{11\pi}{6} + \frac{\pi}{4}\right) = \frac{\tan\frac{11\pi}{6} + \tan\frac{\pi}{4}}{1 - \tan\frac{11\pi}{6} \tan\frac{\pi}{4}}$$

$$= \frac{-\frac{\sqrt{3}}{3} + 1}{1 + \frac{\sqrt{3}}{3}} = \frac{\sqrt{3} + 3}{3} = \frac{\sqrt{3} + 3}{3} \cdot \frac{3}{3 + \sqrt{3}}$$

$$= \frac{3 + \sqrt{3}}{3} = \frac{\sqrt{3} + 3}{3 + \sqrt{3}} \cdot \frac{3 - \sqrt{3}}{3 - \sqrt{3}}$$

$$= \frac{9 + 3\sqrt{3} - 3\sqrt{3} + 3}{6}$$

$$= \frac{12 - 6\sqrt{3}}{6} = \frac{2 - \sqrt{3}}{1}$$

$$\textcircled{7} \sin 3x = 3\cos^2 x \sin x - \sin^3 x$$

$$\sin((x+x)+x) = \sin(x+x)\cos x + \cos(x+x)\sin x$$

$$= \sin(x+x)\cos x + \cos(x+x)\sin x$$

$$= (\sin x \cos x + \cos x \sin x)(\cos x) + (\cos x \cos x - \sin x \sin x)\sin x$$

$$= (2\sin x \cos x)(\cos x) + \cos^2 x \sin x - \sin^3 x$$

$$= 2\cos^2 x \sin x + \cos^2 x \sin x - \sin^3 x$$

$$= 3\cos^2 x \sin x - \sin^3 x$$

$$(8) \cos \left[\left(\frac{\pi}{2} - x \right) - y \right] = \sin(x+y)$$

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

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

$$= \sin x \cos y + \cos x \sin y$$

$$= \sin(x+y)$$

$$(9) \cos \left(x + \frac{3\pi}{4} \right) - \cos \left(x - \frac{3\pi}{4} \right) = 0$$

$$\cos x \cos \frac{3\pi}{4} - \sin x \sin \frac{3\pi}{4} - \left(\cos x \cos \frac{3\pi}{4} + \sin x \sin \frac{3\pi}{4} \right) = 0$$

$$-2 \sin x \sin \frac{3\pi}{4} = 0$$

$$-2 \sin x \cdot \frac{\sqrt{2}}{2} = 0$$

$$-\sqrt{2} \sin x = 0$$

$$\sin x = 0$$

$$x = 0, \pi$$

$$(10) 3 \sin(x - \pi) = 3$$

$$\sin(x - \pi) = 1$$

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

$$-\sin x = 1$$

$$\sin x = -1$$

$$x = \frac{3\pi}{2}$$

$$(11) \tan(\pi - x) + 2 \cos \left(x + \frac{3\pi}{2} \right) = 0$$

$$\frac{\tan \pi - \tan x}{1 + \tan \pi \tan x} + 2 \left(\cos x \cos \frac{3\pi}{2} - \sin x \sin \frac{3\pi}{2} \right) = 0$$

$$1 + \tan \pi \tan x$$

$$-\tan x + 2 \sin x = 0$$

$$2 \sin x = \tan x$$

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

$$\cos x$$

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

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

$$\sin x = 0$$

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

$$x = 0, \pi$$

$$x = \frac{\pi}{3}, \frac{5\pi}{3}$$

$$\textcircled{12} \cos(\overset{\theta}{\arccos x} + \overset{\beta}{\arcsin x})$$

~~cos~~ $\cos \theta \cos \beta - \sin \theta \sin \beta$

$$x \cdot \sqrt{1-x^2} - \sqrt{1-x^2} \cdot x$$
$$x\sqrt{1-x^2} - x\sqrt{1-x^2}$$

$$\textcircled{= 0}$$

