

# Solving Trig Equations with Multiple Angles

1.  $\sin 3x = 1$

①  $3x = \frac{\pi}{2}$

②  $3x = \frac{5\pi}{2}$

③  $3x = \frac{9\pi}{2}$

}  $+2\pi(\frac{4\pi}{2})$   
 } mult. by  $\frac{1}{3}$

$x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{9\pi}{6}$  / Reduce

$x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$

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

①  $2x = \frac{\pi}{6}, \frac{11\pi}{6}$

②  $= \frac{13\pi}{6}, \frac{23\pi}{6}$

}  $+ \frac{12\pi}{6}$

$x = \frac{\pi}{12}, \frac{11\pi}{12}, \frac{13\pi}{12}, \frac{23\pi}{12}$

3.  $\tan 2x = -1$

①  $2x = \frac{3\pi}{4}, \frac{7\pi}{4}$

②  $= \frac{11\pi}{4}, \frac{15\pi}{4}$

}  $+ \frac{8\pi}{4}$

$x = \frac{3\pi}{8}, \frac{7\pi}{8}, \frac{11\pi}{8}, \frac{15\pi}{8}$

4.  $\sec 3x = 2$

$\cos 3x = \frac{1}{2}$

①  $3x = \frac{\pi}{3}, \frac{5\pi}{3}$

②  $= \frac{7\pi}{3}, \frac{11\pi}{3}$

③  $= \frac{13\pi}{3}, \frac{17\pi}{3}$

}  $+ \frac{6\pi}{3}$

$x = \frac{\pi}{9}, \frac{5\pi}{9}, \frac{7\pi}{9}, \frac{11\pi}{9}, \frac{13\pi}{9}, \frac{17\pi}{9}$

5.  $\cot 3x = 1$

①  $3x = \frac{\pi}{4}, \frac{5\pi}{4}$

②  $= \frac{9\pi}{4}, \frac{13\pi}{4}$

③  $= \frac{17\pi}{4}, \frac{21\pi}{4}$

}  $+ \frac{8\pi}{4}$

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

$x = \frac{\pi}{12}, \frac{5\pi}{12}, \frac{3\pi}{4}, \frac{13\pi}{12}, \frac{17\pi}{12}, \frac{7\pi}{4}$

$$6. \sin 2x = -\frac{\sqrt{3}}{2}$$

$$\begin{aligned} \textcircled{1} \quad 2x &= \frac{4\pi}{3}, \frac{5\pi}{3} \\ \textcircled{2} \quad &= \frac{10\pi}{3}, \frac{11\pi}{3} \end{aligned} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} +\frac{6\pi}{3}$$

$$x = \frac{4\pi}{6}, \frac{5\pi}{6}, \frac{10\pi}{6}, \frac{11\pi}{6}$$

$$x = \frac{2\pi}{3}, \frac{5\pi}{6}, \frac{5\pi}{3}, \frac{11\pi}{6}$$

$$7. \cos 3x = -\frac{1}{2}$$

$$\begin{aligned} \textcircled{1} \quad 3x &= \frac{2\pi}{3}, \frac{4\pi}{3} \\ \textcircled{2} \quad &= \frac{8\pi}{3}, \frac{10\pi}{3} \\ \textcircled{3} \quad &= \frac{14\pi}{3}, \frac{16\pi}{3} \end{aligned} \quad \left. \begin{array}{l} \\ \\ \\ \end{array} \right\} +\frac{6\pi}{3}$$

$$x = \frac{2\pi}{9}, \frac{4\pi}{9}, \frac{8\pi}{9}, \frac{10\pi}{9}, \frac{14\pi}{9}, \frac{16\pi}{9}$$

$$8. \csc 2x = -\sqrt{2}$$

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

$$\begin{aligned} \textcircled{1} \quad 2x &= \frac{5\pi}{4}, \frac{7\pi}{4} \\ \textcircled{2} \quad &= \frac{13\pi}{4}, \frac{15\pi}{4} \end{aligned} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} +\frac{8\pi}{4}$$

$$x = \frac{5\pi}{8}, \frac{7\pi}{8}, \frac{13\pi}{8}, \frac{15\pi}{8}$$

$$9. \cos^2 2x = \frac{1}{2}$$

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

$$\begin{aligned} \textcircled{1} \quad 2x &= \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4} \\ \textcircled{2} \quad &= \frac{9\pi}{4}, \frac{11\pi}{4}, \frac{13\pi}{4}, \frac{15\pi}{4} \end{aligned} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} +\frac{8\pi}{4}$$

$$x = \frac{\pi}{8}, \frac{3\pi}{8}, \frac{5\pi}{8}, \frac{7\pi}{8}, \frac{9\pi}{8}, \frac{11\pi}{8}, \frac{13\pi}{8}, \frac{15\pi}{8}$$

$$10. \tan^2 2x = \frac{1}{3}$$

$$\tan 2x = \pm \frac{\sqrt{3}}{3}$$

$$\begin{aligned} \textcircled{1} \quad 2x &= \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6} \\ \textcircled{2} \quad &= \frac{13\pi}{6}, \frac{17\pi}{6}, \frac{19\pi}{6}, \frac{23\pi}{6} \end{aligned} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} +\frac{12\pi}{6}$$

$$x = \frac{\pi}{12}, \frac{5\pi}{12}, \frac{7\pi}{12}, \frac{11\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}, \frac{19\pi}{12}, \frac{23\pi}{12}$$