

# Solving Trig Equations with Multiple Angles Notes

include  $\sin x = \frac{1}{2}$   
 $x = \frac{\pi}{6}, \frac{5\pi}{6}$

SOLVE OVER  $[0, 2\pi)$

\* Double angle  
 $6 \sin 2x - 3 = 0$

$6 \sin 2x = 3$   
 $\sin 2x = \frac{1}{2}$

①  $2x = \frac{\pi}{6}, \frac{5\pi}{6}$   
 ②  $2x = \frac{13\pi}{6}, \frac{17\pi}{6}$

Mult. all by  $\frac{1}{2}$   
 $x = \frac{\pi}{12}, \frac{5\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}$

\* 2 solutions became 4

\* Quadruple angle  
 $5 \tan 4x - 5 = 0$

$\tan 4x = 1$

①  $4x = \frac{\pi}{4}, \frac{5\pi}{4}$   
 ②  $4x = \frac{9\pi}{4}, \frac{13\pi}{4}$   
 ③  $4x = \frac{17\pi}{4}, \frac{21\pi}{4}$   
 ④  $4x = \frac{25\pi}{4}, \frac{29\pi}{4}$

Mult. all by  $\frac{1}{4}$   
 $x = \frac{\pi}{16}, \frac{5\pi}{16}, \frac{9\pi}{16}, \frac{13\pi}{16}, \frac{17\pi}{16}, \frac{21\pi}{16}, \frac{25\pi}{16}, \frac{29\pi}{16}$

\* 2 solutions became 8 solutions

SOLVE OVER  $[0, 2\pi)$

\* triple angle  
 $\sec 3x = \sqrt{2}$

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

①  $3x = \frac{\pi}{4}, \frac{7\pi}{4}$   
 ②  $3x = \frac{9\pi}{4}, \frac{15\pi}{4}$   
 ③  $3x = \frac{17\pi}{4}, \frac{23\pi}{4}$

Mult. all by  $\frac{1}{3}$   
 $x = \frac{\pi}{12}, \frac{7\pi}{12}, \frac{9\pi}{12}, \frac{15\pi}{12}, \frac{17\pi}{12}, \frac{23\pi}{12}$

\* 2 solutions became 6 solutions

SOLVE OVER  $[0, 2\pi)$

$\cot^2 2x = 3$

$\cot 2x = \pm\sqrt{3}$

①  $2x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$   
 ②  $2x = \frac{13\pi}{6}, \frac{17\pi}{6}, \frac{19\pi}{6}, \frac{23\pi}{6}$

Mult. by  $\frac{1}{2}$   
 $x = \frac{\pi}{12}, \frac{5\pi}{12}, \frac{7\pi}{12}, \frac{11\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}, \frac{19\pi}{12}, \frac{23\pi}{12}$