Precalculus

Name_____ ID: 1

WS 5.3 Multiple Angle Solutions

Date 4/18/17 Period____

Solve each equation, (All solutions)

1) $\frac{3}{1} + \sin\frac{\theta}{3} = \frac{5}{2}$

$\sin\frac{\theta}{3} = \frac{5}{2} - \frac{6}{2}$

$\sin\frac{\theta}{3} = -\frac{1}{2}$

$\frac{\theta}{3} = \frac{7\pi}{6} + 2\pi n$ $\frac{\theta}{3} = \frac{11\pi}{6} + 2\pi n$

$\theta = \frac{21\pi}{6} + 6\pi n$

$\theta = \frac{33\pi}{6} + 6\pi n$

2) $-2 = -2 + \cos 3\theta$

$0 = \cos 3\theta$

$3\theta = \frac{\pi}{2} + 2\pi n$ $3\theta = \frac{3\pi}{2} + 2\pi n$

$\theta = \frac{\pi}{2}\cdot\frac{1}{3} + \frac{2\pi n}{3}$ $\theta = \frac{3\pi}{2}\cdot\frac{1}{3} + \frac{2\pi n}{3}$

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

$\theta = \frac{\pi}{2} + \frac{2\pi n}{3}$

3) $5 + \sin 2\theta = \frac{9}{2}$

$\sin 2\theta = \frac{9}{2} - \frac{10}{2}$

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

$2\theta = \frac{7\pi}{6} + 2\pi n$ $2\theta = \frac{11\pi}{6} + 2\pi n$

$\theta = \frac{7\pi}{6}\cdot\frac{1}{2} + \pi n$ $\theta = \frac{11\pi}{6}\cdot\frac{1}{2} + \pi n$

$\theta = \frac{7\pi}{12} + \pi n$

$\theta = \frac{11\pi}{12} + \pi n$

4) $-4\cos\frac{\theta}{4} = 2\sqrt{2}$

$\cos\frac{\theta}{4} = -\frac{\sqrt{2}}{2}$

$\frac{\theta}{4} = \frac{3\pi}{4} + 2\pi n$ $\frac{\theta}{4} = \frac{5\pi}{4} + 2\pi n$

$\theta = \frac{12\pi}{4} + 8\pi n$ $\theta = \frac{20\pi}{4} + 8\pi n$

$\theta = 3\pi + 8\pi n$ $\theta = 5\pi + 8\pi n$

5) $2\sin 4\theta = 1$

$\sin 4\theta = \frac{1}{2}$

$4\theta = \frac{\pi}{6} + 2\pi n$ $4\theta = \frac{5\pi}{6} + 2\pi n$

$\theta = \frac{\pi}{6}\cdot\frac{1}{4} + \frac{2\pi n}{4}$ $\theta = \frac{5\pi}{6}\cdot\frac{1}{4} + \frac{2\pi n}{4}$

$\theta = \frac{\pi}{24} + \frac{\pi n}{2}$ $\theta = \frac{5\pi}{24} + \frac{\pi n}{2}$

6) $-2\sin 2\theta = -\sqrt{2}$

$\sin 2\theta = -\frac{\sqrt{2}}{2} \Rightarrow \sin 2\theta = \frac{\sqrt{2}}{2}$

$2\theta = \frac{\pi}{4} + 2\pi n$ $2\theta = \frac{3\pi}{4} + 2\pi n$

$\theta = \frac{\pi}{4}\cdot\frac{1}{2} + \pi n$ $\theta = \frac{3\pi}{4}\cdot\frac{1}{2} + \pi n$

$\theta = \frac{\pi}{8} + \pi n$ $\theta = \frac{3\pi}{8} + \pi n$

7) $\tan 3\theta = -1$

$3\theta = \frac{3\pi}{4} + 2\pi n$ $3\theta = \frac{7\pi}{4} + 2\pi n$

$\theta = \frac{3\pi}{4}\cdot\frac{1}{3} + \frac{2\pi n}{3}$ $\theta = \frac{7\pi}{4}\cdot\frac{1}{3} + \frac{2\pi n}{3}$

$\theta = \frac{\pi}{4} + \frac{2\pi n}{3}$ $\theta = \frac{7\pi}{12} + \frac{2\pi n}{3}$

8) $\tan\frac{\theta}{2} = -\sqrt{3}$

$\frac{\theta}{2} = \frac{4\pi}{3} + 2\pi n$ $\frac{\theta}{2} = \frac{7\pi}{4} + 2\pi n$

$\theta = \frac{8\pi}{3} + 4\pi n$ $\theta = \frac{14\pi}{4} + \frac{8\pi n}{4}$

$\theta = \frac{7\pi}{2} + 4\pi n$

Find all solutions to each equation

9) $-2 = \csc\theta$

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

$\theta = \frac{7\pi}{6} + 2\pi n$

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

10) $-\frac{1}{2} = -1 + \sin\theta$

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

$\theta = \frac{\pi}{6}, \frac{5\pi}{6}$

$+2\pi n \quad +2\pi n$

11) $\frac{2}{5}\cos\theta = -\frac{\sqrt{3}}{5}$

$\cos\theta = -\frac{\sqrt{3}}{5} \cdot \frac{5}{2}$

$\cos\theta = -\frac{\sqrt{3}}{2}$

$\theta = \frac{5\pi}{6} + 2\pi n$

$\theta = \frac{7\pi}{6} + 2\pi n$

12) $-1 + \csc\theta = -3$

$\csc\theta = -2$

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

$\theta = \frac{7\pi}{6} + 2\pi n$

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

13) $-2 + \frac{1}{3}\cot\theta = -\frac{7}{3}$

$\frac{1}{3}\cot\theta = -\frac{7}{3} + \frac{6}{3}$

$\frac{1}{3}\cot\theta = -\frac{1}{3}$

$\cot\theta = -1$

$\tan\theta = -1$

$\theta = \frac{3\pi}{4} + 2\pi n, \quad \theta = \frac{7\pi}{4} + 2\pi n$

14) $-5 = -5 - 4\cot\theta$

$0 = -4\cot\theta$

$0 = \cot\theta$

$\text{und} = \tan\theta$

$\theta = \frac{\pi}{2} + 2\pi n$

$\theta = \frac{3\pi}{2} + 2\pi n$

15) $7 = 3 - 8\csc\theta$

$4 = -8\csc\theta$

$-\frac{1}{2} = \csc\theta$

$-2 = \sin\theta$

no solution

16) $-4 + \csc\theta = -6$

$\csc\theta = -2$

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

$\theta = \frac{7\pi}{6} + 2\pi n$

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