

Name: Key

Class: _____

Extra 5.4 Practice: Multiple Angle Trigonometric Identities

Part 1: Solve for X

<p>1. $\sin 2x - \sin x = 0$</p> $2\sin x \cos x - \sin x = 0$ $\sin x (2\cos x - 1) = 0$ $\sin x = 0 \quad \cos x = \frac{1}{2}$ <div style="border: 1px solid red; padding: 5px; display: inline-block;"> $x = 0, \pi, \frac{\pi}{3}, \frac{5\pi}{3}$ </div>	<p>2. $7\cos^2 x + 6\cos x = \cos 2x$</p> $7\cos^2 x + 6\cos x = 2\cos^2 x - 1$ $5\cos^2 x + 6\cos x + 1 = 0$ $5x^2 + 6x + 1 = 0$ $(5x + 1)(x + 1) = 0$ $\cos x = -\frac{1}{5} \quad \cos x = -1$ <div style="border: 1px solid purple; padding: 5px; display: inline-block;"> $x = \pi$ </div>
<p>3. $\cos 2x + 3\sin x = 2$</p> $1 - 2\sin^2 x + 3\sin x = 2$ $2\sin^2 x - 3\sin x + 1 = 0$ $2x^2 - 3x + 1 = 0$ $(2x - 1)(x - 1) = 0$ $\sin x = \frac{1}{2} \quad \sin x = 1$ <div style="border: 1px solid orange; padding: 5px; display: inline-block;"> $x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{\pi}{2}$ </div>	<p>4. $\sin 6x + \sin 12x = 0 \quad \theta = 6x$</p> $\sin \theta + \sin 2\theta = 0$ $\sin \theta + 2\sin \theta \cos \theta = 0$ $\sin \theta (1 + 2\cos \theta) = 0$ $\sin \theta = 0 \quad \cos \theta = -\frac{1}{2}$ $\theta = 0, \pi, \frac{2\pi}{3}, \frac{4\pi}{3}$ <div style="border: 1px solid blue; padding: 5px; display: inline-block;"> $x = 0, \frac{\pi}{6}, \frac{\pi}{9}, \frac{2\pi}{9}$ </div>

Part 2: Half-angle Identities

<p>5. Find the exact value of $\cos \frac{7\pi}{12}$ use $\frac{7\pi}{6}$</p> $\cos \frac{\theta}{2} = \pm \sqrt{\frac{1 + \cos \theta}{2}}$ $\cos \frac{7\pi}{12} = -\sqrt{\frac{1 + \cos \frac{7\pi}{6}}{2}} = -\sqrt{\frac{1 - \frac{\sqrt{3}}{2}}{2}}$ $= -\sqrt{\frac{\frac{2 - \sqrt{3}}{2}}{2}} = -\sqrt{\frac{2 - \sqrt{3}}{4}}$ <div style="border: 1px solid green; padding: 5px; display: inline-block;"> $= -\frac{\sqrt{2 - \sqrt{3}}}{2}$ </div>	<p>6. Find the exact value of $\tan \frac{\pi}{8}$ use $\frac{\pi}{4}$</p> $\tan \frac{\theta}{2} = \frac{1 - \cos \theta}{\sin \theta} \rightarrow \frac{1 - \cos \frac{\pi}{4}}{\sin \frac{\pi}{4}}$ $\frac{1 - \frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} = \frac{2 - \sqrt{2}}{2} = \frac{2 - \sqrt{2}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$ $\frac{2\sqrt{2} - 2}{2} = \sqrt{2} - 1$ <div style="border: 1px solid green; padding: 5px; display: inline-block;"> $\sqrt{2} - 1$ </div>
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