

5.3 Solving Trig Equations Practice Worksheet #1
Pre-calculus

Name: Key
Date: _____ Block: _____

Solve for the unknown variable on the interval $0 \leq x < 2\pi$.

1. $4 \cos^2 x - 3 = 0$

$$\cos^2 x = \frac{3}{4}$$

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

$$x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$$

2. $\sqrt{2} \sin 2x = 1$

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

$$2x = \frac{\pi}{4} \text{ or } \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$$

$$x = \frac{\pi}{8} \text{ or } \frac{3\pi}{8}, \frac{5\pi}{8}, \frac{7\pi}{8}$$

3. $3 \cot^2 x - 1 = 0$

$$\cot^2 x = \frac{1}{3}$$

$$\cot x = \pm \frac{1}{\sqrt{3}} = \pm \frac{\sqrt{3}}{3}$$

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

$$x = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$$

4. $\cos^3 x = \cos x$

$$\cos^3 x - \cos x = 0$$

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

$$\cos x = 0 \quad \cos^2 x - 1 = 0$$

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

$$\cos^2 x = 1$$

$$\cos x = \pm 1$$

$$x = 0, \pi$$

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

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

$$\sin x = 0 \quad 1 - 2 \cos x = 0$$

$$x = 0, \pi$$

$$1 = 2 \cos x$$

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

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

6. $2 \sin^2 x - \sin x - 3 = 0$

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

$$2 \sin x - 3 = 0$$

$$\sin x + 1 = 0$$

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

$$\sin x = -1$$

$x = \text{NOT Possible}$

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

7. $\csc^2 x - \csc x - 2 = 0$

$$(\csc x - 2)(\csc x + 1) = 0$$

$$\csc x = 2$$

$$\csc x = -1$$

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

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

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

$$\sin x = -1$$

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

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

8. $\cos^2 x = 1 - \sin x$

$$1 - \sin^2 x = 1 - \sin x$$

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

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

$$\sin x = 0 \quad \sin x - 1 = 0$$

$$\sin x = 1$$

$$x = 0, \pi$$

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

Solve for the unknown variable on the given interval.

9. $\sqrt{3} + \tan(2x) = 0$ on $[0, 2\pi)$.

$$\tan(2x) = -\sqrt{3}$$

$$2x = \frac{2\pi}{3} \text{ or } \frac{5\pi}{3}$$

$$x = \frac{\pi}{3} \text{ or } \frac{5\pi}{6}$$

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

10. $\cos(\pi x) = 0.5$ on $[0, 2)$.

$$\pi x = \frac{\pi}{3} \text{ or } \frac{5\pi}{3}$$

$$x = \frac{1}{3} \text{ or } \frac{5}{3}$$

11. $\sin\left(\frac{x}{2}\right) - 1 = 0$ on $[0, 8\pi)$.

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

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

$$x = \pi$$

5.3 Solving Trig Equations – Worksheet #2
Pre-calculus

Name: _____
Date: _____ Block: _____

$0 \leq \theta < 2\pi$

Part 1: Solve for the unknown variable. Give all of the exact general solutions.

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

$\theta = \frac{\pi}{4}, \frac{3\pi}{4}$

2. $\cos \theta = \sin \theta$

$\theta = \frac{\pi}{4}, \frac{5\pi}{4}$

3. $\tan \theta = 1$

$\theta = \frac{\pi}{4}, \frac{5\pi}{4}$

4. $1 + \sin \theta = 2 \cos^2 \theta$

$1 + \sin \theta = 2(1 - \sin^2 \theta)$

$1 + \sin \theta = 2 - 2\sin^2 \theta$

$2\sin^2 \theta + \sin \theta - 1 = 0$

$(2\sin \theta - 1)(\sin \theta + 1) = 0$

$2\sin \theta - 1 = 0 \quad \sin \theta + 1 = 0$

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

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

5. $2 \cos^2 \theta + \cos \theta = 0$

$\cos \theta (2\cos \theta + 1) = 0$

$\cos \theta = 0 \quad 2\cos \theta + 1 = 0$

$\theta = \frac{\pi}{2}, \frac{3\pi}{2} \quad \cos \theta = -\frac{1}{2}$

$\theta = \frac{2\pi}{3}, \frac{4\pi}{3}$

6. $\sin 3\theta = -1$

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

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

7. $\sin^2 \theta - 1 = 0$

$\sin^2 \theta = 1$

$\sin \theta = \pm 1$

$\theta = \frac{\pi}{2}, \frac{3\pi}{2}$

8. $\cos 2\theta = \frac{1}{2}$

$2\theta = \frac{\pi}{3}, \frac{5\pi}{3}, \frac{7\pi}{3}, \frac{11\pi}{3}$

$\theta = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$

9. $2 \sin^2 \theta - \sin \theta - 1 = 0$

$(2\sin \theta + 1)(\sin \theta - 1) = 0$

$2\sin \theta + 1 = 0 \quad \sin \theta - 1 = 0$

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

$\theta = \frac{7\pi}{6}, \frac{11\pi}{6} \quad \theta = \frac{\pi}{2}$

10. $\tan 4\theta = -1$

$4\theta = \frac{3\pi}{4}, \frac{7\pi}{4}, \frac{11\pi}{4}, \frac{15\pi}{4}, \frac{19\pi}{4}, \frac{23\pi}{4}, \frac{27\pi}{4}, \frac{31\pi}{4}$

$\theta = \frac{3\pi}{16}, \frac{7\pi}{16}, \frac{11\pi}{16}, \frac{15\pi}{16}, \frac{19\pi}{16}, \frac{23\pi}{16}, \frac{27\pi}{16}, \frac{31\pi}{16}$

11. $\tan^2 3x = 3$

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

$3x = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}, \frac{7\pi}{3}, \frac{8\pi}{3}, \frac{10\pi}{3}, \frac{11\pi}{3}$

$\frac{13\pi}{3}, \frac{14\pi}{3}, \frac{16\pi}{3}, \frac{17\pi}{3}$

$x = \frac{\pi}{9}, \frac{2\pi}{9}, \frac{4\pi}{9}, \frac{5\pi}{9}, \frac{7\pi}{9}, \frac{8\pi}{9}, \frac{10\pi}{9}, \frac{11\pi}{9}, \frac{13\pi}{9}, \frac{14\pi}{9}, \frac{16\pi}{9}, \frac{17\pi}{9}$

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

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

$x = \frac{\pi}{2}, \frac{7\pi}{2}$