5.3 Solving Trig Equations – Worksheet #2
Pre-calculus

Name: Key
Date: ____________________ Block: ____

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

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

$\frac{3\pi}{4} + 2\pi n$ and $\frac{\pi}{4} + 2\pi n$

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

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

3. $\tan\theta = 1$

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

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

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

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

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

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

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

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

$\sin\theta = 1/2$ $\quad$ $\sin\theta = -1$

$\boxed{5\pi/6 + 2\pi n,\ \frac{\pi}{6} + 2\pi n,\ \frac{3\pi}{2} + 2\pi n}$

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

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

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

$\boxed{\frac{\pi}{2} + \pi n \quad \frac{2\pi}{3} + 2\pi n \quad \frac{4\pi}{3} + 2\pi n}$

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

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

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

Reduce

$\boxed{\frac{\pi}{2} + \frac{2}{3}\pi n}$

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

$\sin^2\theta = 1$

$\sin\theta = \pm 1$

$\boxed{\frac{\pi}{2} + \pi n}$

8. $\cos 2\theta = ½$

$\boxed{\frac{\pi}{6} + \pi n \quad \frac{5\pi}{6} + \pi n}$

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

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

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

$\boxed{\frac{7\pi}{6} + 2\pi n \quad \frac{\pi}{2} + 2\pi n \quad \frac{11\pi}{6} + 2\pi n}$

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

$4\theta = \frac{3\pi}{4}$ and $\frac{7\pi}{4}$

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

$\boxed{\frac{3\pi}{16} + \frac{\pi}{4}n}$

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

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

$\frac{\pi}{3} + \pi n = 3x$

$\boxed{\frac{\pi}{9} + \frac{\pi}{3}n \text{ and } \frac{2\pi}{9} + \frac{\pi}{3}n}$

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

$\frac{\pi}{4}$ and $\frac{7\pi}{4}$

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

$\boxed{x = \frac{\pi}{2} + 4\pi n \text{ and } \frac{7\pi}{2} + 4\pi n}$

5.3 Solving Trig Equations Practice Worksheet #1
Pre-calculus

Name: Key
Date: ____________ Block: ____

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

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

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

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

$\boxed{\frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}}$

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

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

$2x = \frac{\pi}{4}$ and $2x = \frac{3\pi}{4}$

$\boxed{x = \frac{\pi}{8} \text{ and } \frac{3\pi}{8}}$

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

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

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

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

$\boxed{\frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}}$

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

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

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

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

$\cos x = \pm 1$

$\boxed{\frac{\pi}{2}, \frac{3\pi}{2} \quad 0, \pi}$

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

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

$\sin x = 0$

$1 - 2\cos x = 0$

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

$\boxed{0, \pi, \frac{\pi}{3}, \frac{5\pi}{3}}$

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

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

$2\sin x - 3 = 0$

$\sin x = 3/2 \rightarrow$ NEVER

$\sin x = -1 = \boxed{\frac{3\pi}{2}}$

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

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

$\csc x = 2$ $\quad$ $\csc x = -1$

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

$\boxed{\frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}}$

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

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

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

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

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

$\boxed{0, \pi, \pi/2}$

Solve for the unknown variable on the given interval.

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

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

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

— SKIP —