Unit 7 / Day 5

Solving Trig Equations
(Day 1)

Objective:

Students will be able to solve trig equations.

Unit 7 / Day 5

Solve the following trig equations.
Solutions should be between $0 \leq \theta < 2\pi$.
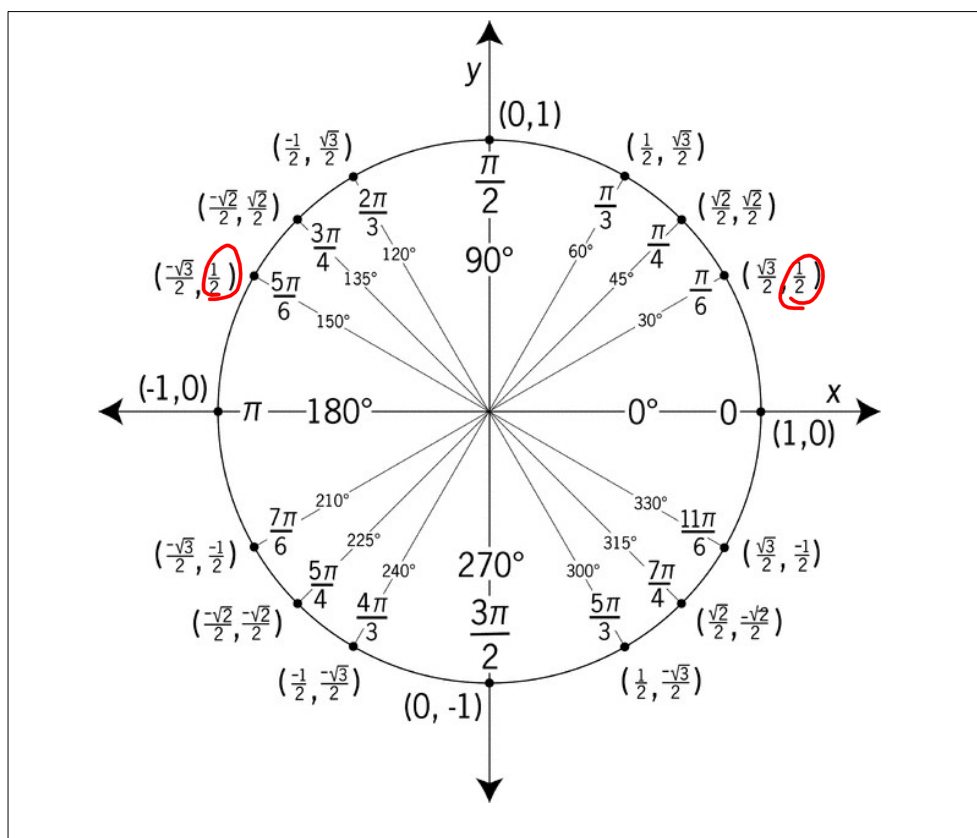
1. $2\cos\theta + 6 = 7$ $2x + 6 = 7$

$$\frac{\cancel{2}\cos\theta}{\cancel{2}} = \frac{1}{2}$$

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

$$\theta = \cos^{-1}\left(\frac{1}{2}\right)$$

$$\theta = \frac{\pi}{3}, \frac{5\pi}{3} \text{ rads}$$

Solutions should be between $0 \leq \theta < 2\pi$.

2.
$$4\tan\theta = 3 + \tan\theta$$
$$-\tan\theta \qquad -\tan\theta$$

$$4x = 3 + x$$

$$\frac{3\tan\theta}{3} = \frac{3}{3}$$

$$\tan\theta = 1 \qquad \frac{y}{x}$$

$$\boxed{\theta = \frac{\pi}{4}, \frac{5\pi}{4} \text{ rads}}$$

3.

$$4\sin\theta + \sqrt{3} = 2\sin\theta$$

$$-4\sin\theta \qquad -4\sin\theta$$

$$4x + \sqrt{3} = 2x$$

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

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

$$\boxed{\theta = \frac{4\pi}{3}, \frac{5\pi}{3} \text{ rads}}$$

4.

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

$$2x^2 - 1 = 0$$

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

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

$$\sin\theta = \pm\frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$$

$$\sin\theta = \pm\frac{\sqrt{2}}{2}$$

$$\boxed{\theta = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4} \text{ rads}}$$

5. $3\tan^2\theta - 1 = 0$ $3x^2 - 1 = 0$

$$3\tan^2\theta = 1$$

$$\sqrt{\tan^2\theta} = \sqrt{\frac{1}{3}}$$

$$\tan\theta = \boxed{\pm\frac{1}{\sqrt{3}}}\cdot\frac{\sqrt{3}}{\sqrt{3}} = \pm\frac{\sqrt{3}}{3}$$

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

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6. $\cos^2\theta + 2\cos\theta = 3$ $x^2 + 2x = 3$

$$x^2 + 2x - 3 = 0$$

$\cos\theta = -3$ $\cos\theta = 1$

$\theta = \phi$ $\boxed{\theta = 0 \text{ rads}}$

$3 \diagup\!\!\!\!\diagdown \begin{matrix}-3\\-1\end{matrix}$
$\diagup 2 \diagdown$

unit circle is
bounded by
± 1
$(\sin\theta/\cos\theta)$

$$(x+3)(x-1) = 0$$

$$x = -3 \quad x = 1$$

7. $4\sin^2\theta - 4\sin\theta = -1$

$4x^2 - 4x = -1$

$4x^2 - 4x + 1 = 0$

	$2x$	-1
$2x$	$4x^2$	$-2x$
-1	$-2x$	1

4
-2×-2
-4

$(2x-1)(2x-1) = 0$

$x = \dfrac{1}{2}$

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

$\boxed{\theta = \dfrac{\pi}{6}, \dfrac{5\pi}{6} \text{ rads}}$

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8. $2\cos^2\theta - \cos\theta = 1$

$2x^2 - x = 1$

$2x^2 - x - 1 = 0$

	x	-1
$2x$	$2x^2$	$-2x$
1	$1x$	-1

-2
-2×1
-1

$(2x+1)(x-1) = 0$
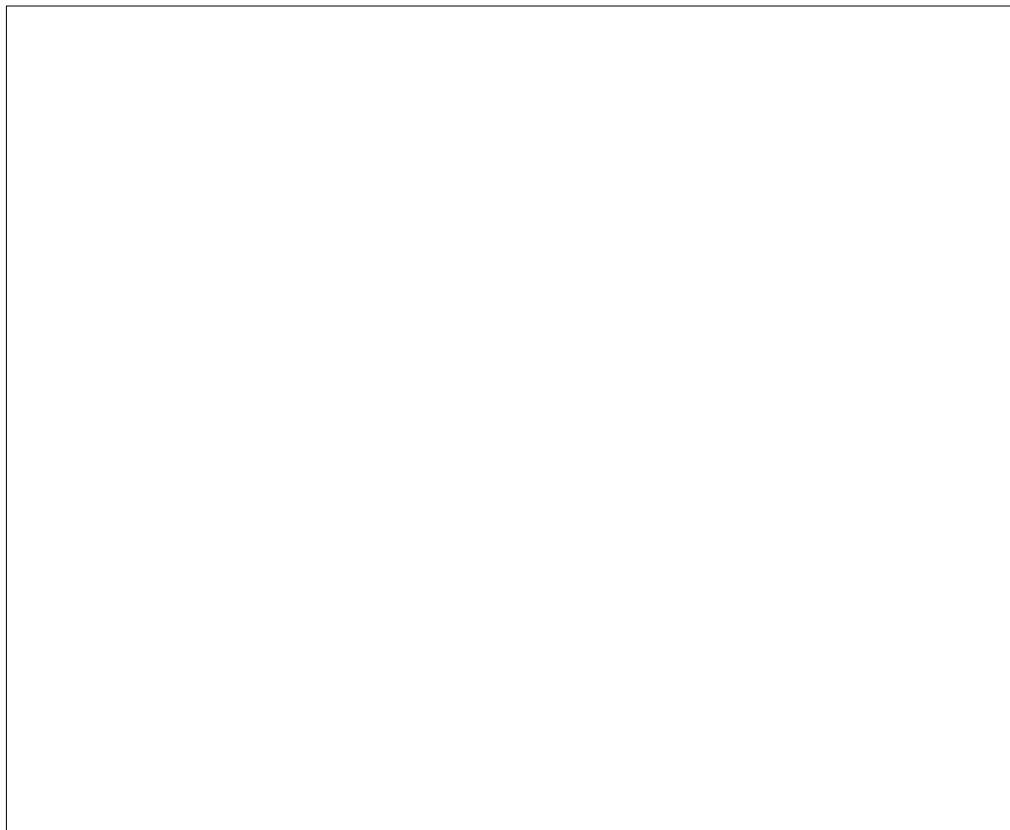
$x = -\dfrac{1}{2}$ $x = 1$

$\cos\theta = -\dfrac{1}{2}$ $\cos\theta = 1$

$\boxed{\theta = \dfrac{2\pi}{3}, \dfrac{4\pi}{3}, 0 \text{ rads}}$

$a = \frac{1}{2}$ $b: \quad \frac{4\pi}{6} = \frac{2\pi}{3}$ $k = -1$

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

$b = 3$

$y = \frac{1}{2}\cos(3(\theta \quad)) - 1$ $\smile$ 0

$y = -\frac{1}{2}\cos(3(\theta - \frac{\pi}{3})) - 1$ $\wedge$ $\frac{2\pi}{6} = \frac{\pi}{3}$

$y = \frac{1}{2}\sin(3(\theta + \frac{\pi}{6})) - 1$ $\sim$ $-\frac{\pi}{6}$

$y = -\frac{1}{2}\sin(3(\theta - \frac{\pi}{6})) - 1$ $\vee$ $+\frac{\pi}{6}$
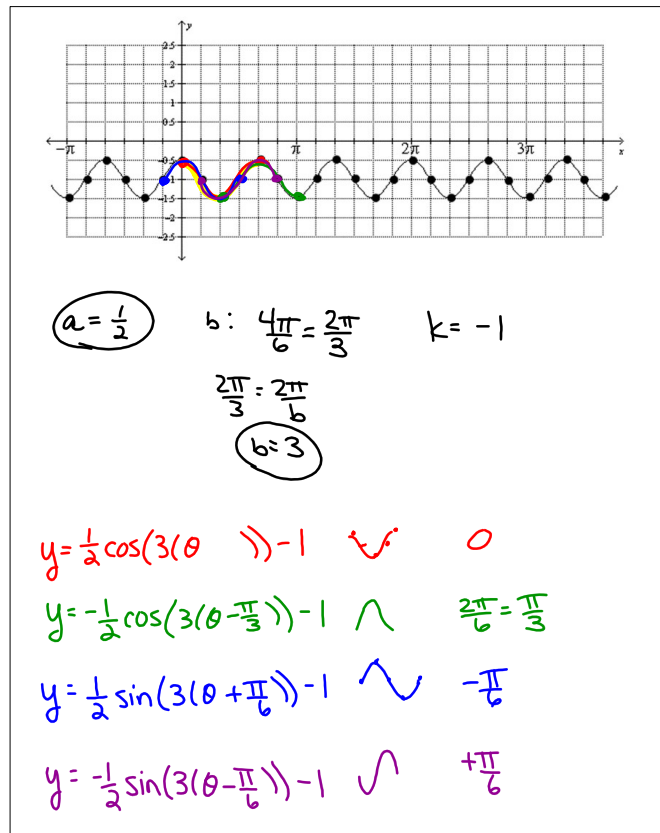
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