November ~~4~~ 5

SWBAT:

Simplify and solve trig equations

Essential Learning Goals:

- Prove trig identites and formulas and use them to solve problems.

Find all solutions

$2\cos^2(4x) - 1 = 0$

$$2\cos^2(4x) - 1 = 0$$
$$\quad +1 \quad +1$$
$$\frac{2\cos^2(4x)}{2} = \frac{1}{2}$$
$$\cos^2(4x) = \frac{1}{2}$$
$$\sqrt{\cos^2(4x)} = \sqrt{\frac{1}{2}}$$
$$\cos(4x) = \pm\frac{1}{\sqrt{2}} = \pm\sqrt{\frac{1}{2}} \to \pm\sqrt{\frac{2}{4}}$$
$$\cos^{-1}(\cos 4x) = \cos^{-1}\left(\pm\sqrt{\frac{1}{2}}\right) = \cos^{-1}\left(\pm\frac{\sqrt{2}}{2}\right)$$
$$\frac{4x}{4} = \frac{\frac{\pi}{4}}{4}, \frac{\frac{3\pi}{4}}{4}, \frac{\frac{5\pi}{4}}{4}, \frac{\frac{7\pi}{4}}{4}, \frac{\frac{9\pi}{4}}{4} \ldots$$
$$x = \frac{\pi}{16}, \frac{3\pi}{16}, \frac{5\pi}{16}, \frac{7\pi}{16}, \ldots \frac{(2n+1)\pi}{16}$$

Find all solutions on the interval $[0, 2\pi)$

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

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

$$\tan(x) = 0$$
$$\tan^{-1}(\tan x) = \tan^{-1}(0)$$
$$x = 0, \pi$$

$$\tan(x) - 1 = 0$$
$$\quad +1 \quad +1$$
$$\tan(x) = 1$$
$$\tan^{-1}(\tan x) = \tan^{-1}(1)$$
$$x = \frac{\pi}{4}, \frac{5\pi}{4}$$

Find all solutions on the interval $[0, 2\pi)$

$\cos^3(x) = \cos(x)$

$$\cos^3(x) = \cos(x)$$
$$-\cos(x) \quad -\cos(x)$$
$$\cos^3(x) - \cos(x) = 0$$
$$\cos(x)(\cos^2(x) - 1) = 0$$

$$y^3 - y = 0$$
$$y(y^2 - 1) = 0$$

$$\cos(x) = 0$$
$$\cos^{-1}(\cos x) = \cos^{-1}(0)$$
$$x = \frac{\pi}{2}, \frac{3\pi}{2}$$

$$\cos^2(x) - 1 = 0$$
$$+1 \quad +1$$
$$\sqrt{\cos^2(x)} = \sqrt{1}$$
$$\cos(x) = \pm 1$$
$$\cos^{-1}(\cos x) = \cos^{-1}(\pm 1)$$
$$x = 0, \pi$$

Find all solutions on the interval $[0, 2\pi)$

$2\sin^2 x + 3\sin x + 1 = 0$

$$2y^2 + 3y + 1 = 0$$
$$(2y+1)(y+1) = 0$$
$$1 + 2 = 3$$
$$1 \times 2 = 2$$
$$2y^2 + 1y + 2y + 1$$
$$y(2y+1) + 1(2y+1)$$
$$(2y+1)(y+1)$$

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

$$2\sin x + 1 = 0$$
$$-1 \quad -1$$
$$\frac{2\sin x}{2} = \frac{-1}{2}$$
$$\sin x = -\frac{1}{2}$$
$$\sin^{-1}(\sin x) = \sin^{-1}\left(-\frac{1}{2}\right)$$
$$x = \frac{7\pi}{6}, \frac{11\pi}{6}$$

$$\sin x + 1 = 0$$
$$-1 \quad -1$$
$$\sin x = -1$$
$$\sin^{-1}(\sin x) = \sin^{-1}(-1)$$
$$x = \frac{3\pi}{2}$$