Lesson 75 Objective: SWBAT solve second degree trig equations.

Kickoff-

1) Verify the following: $\sec x + \tan x = \dfrac{\cos x}{1 - \sin x}$

2) Solve the following:

a) $3\tan\theta + 2 = 7 - \tan\theta$ (b) $\sin\theta = 0$ c) $2\cos\theta - 1 = 0$

let $\tan\theta = x$

$3x + 2 = 7 - x$

$x = \frac{5}{4}$

$\tan\theta = \frac{5}{4}$

$\tan^{-1}(5/4)$

ref $\measuredangle$ 51

$\theta = 51$, $\theta = 231$

$\theta = 0, 180, 360$

$x = 1/2$

$\cos\theta = 1/2$

ref $\measuredangle$ 60

$\theta = 60$

$\theta = 300$

① $\sec x + \tan x = \dfrac{\cos x}{1 - \sin x}\dfrac{(1+\sin x)}{(1+\sin x)}$

$\sec x + \tan x = \dfrac{\cos x(1+\sin x)}{1 - \sin^2 x}$

$\sec x + \tan x \quad \dfrac{\cancel{\cos x}(1+\sin x)}{\cos^{\cancel{2}} x}$

$\sec x + \tan x = \dfrac{1 + \sin x}{\cos x}$

$\dfrac{1}{\cos x} + \dfrac{\sin x}{\cos x}$

$\sec x + \tan x$

① 45, 135

② 210, 150

③ 66, 294

④ 60, 120

⑤ 44, 136

⑥ $\cot\theta = -\sqrt{3}$

$\frac{1}{\tan\theta} = -\frac{\sqrt{3}}{1}$

$\tan\theta = -\frac{1}{\sqrt{3}}$

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

$\theta = 150$

$\theta = 330$

⑦ $5\pi/6, 7\pi/6$

⑧ $\pi/4, 5\pi/4$

⑨ $\theta = \pi, 2\pi$

⑩ $\pi/6, 5\pi/6$

⑪ $\pi/3, 2\pi/3$

⑫ $2\pi/3, 4\pi/3$

⑬ $\sec\theta = -2$

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

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

ref $\measuredangle$ (60) $\pi/3$

$\theta = 2\pi/3$

$\theta = 4\pi/3$

S | A

T | C

$2\pi/3$ $\pi/3$

$4\pi/3$ $5\pi/3$

⑭ $\sin\theta = 0$

$\theta = 0, \pi, 2\pi$

Second Degree Trig Equations

Solving Second Degree Trig Equations:

1) Substitute x for the given trig function.
2) Set = 0 and factor OR Quadratic Formula OR Complete the Square
3) Substitute the trig function back in for x.
4) Find the reference angle(s) and use it to find all solutions

Examples: Find all values of θ, to the **nearest degree**, on the given interval.

1) $\sin^2\theta - \sin\theta = 0$ $0 < \theta < 360$

Let $x = \sin\theta$

$x^2 - x = 0$

$x(x-1) = 0$

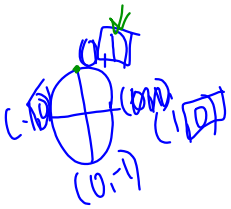
$x = 0 \quad x = 1$

$\sin\theta = 0 \quad \sin\theta = 1$

$\theta = \cancel{0}, \cancel{360}, 180 \qquad \theta = 90$

$\theta = 180°$

$\theta = 90°$



2) $4\tan^2\theta = 1$ $0 < \theta < 360$

Let $\tan\theta = x$

$4x^2 = 1$

$-1 \quad -1$

$4x^2 - 1 = 0$

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

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

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

ref $\measuredangle$ 27

$\theta = 27 \quad \theta = 207$

$\tan\theta = -\frac{1}{2}$

$\theta = 153 \quad \theta = 333$

3) $\sin^2\theta - 4\sin\theta = 1$ $0 < \theta < 360$

4) $\sec^2\theta - 3\sec\theta = 28$ $0 \le \theta \le 2\pi$

5) $\tan^2\theta - 3 = 0$ $0 \le \theta \le 2\pi$

6) $2\tan\theta(\tan\theta + 1) = 3$ $0 \le \theta \le \pi$

let $x = \tan\theta$

$2x(x+1) = 3$

$2x^2 + 2x = 3$

$-3 \quad -3$

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

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \dfrac{-2 \pm \sqrt{2^2 - 4(2)(-3)}}{2(2)} = \dfrac{-2 \pm \sqrt{28}}{4}$ $\sqrt{4}$ $\sqrt{7}$

$\tan\theta = \dfrac{-1 \pm 1\sqrt{7}}{2}$

$\tan\theta = \dfrac{-1 + \sqrt{7}}{2}$ $\tan\theta = \dfrac{-1 - \sqrt{7}}{2}$ $\dfrac{-\cancel{2}^{1} \pm \cancel{2}\sqrt{7}}{\cancel{4}\,2}$

ref $\measuredangle$ 39 ref $\measuredangle$ 61

I θ II θ

~~III θ~~ ~~IV θ~~