Solving Trig Equations Part 2

Quadratic Trig Equations - *Reminder, $\sin^2 x =$

Solve $0 \le x < 2\pi$:

$\sin^2 x - \frac{1}{4} = 0$

$\cos^2 x - 1 = 0$

Last day we solved linear equations, what about factored ones $0 \le x < 2\pi$?

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

$2\cos x\left(\cos x + \frac{1}{2}\right) = 0$

So far our newest strategy is to factor equations in order to solve them:

One thing that can help is making a substitution

Trig expression	*Substitution*
$\sin^2 x - 3\sin x$	
$\csc^2 x - 3\csc x - 28$	
$2\cos^2 x + 7\cos x - 4$	

Solve by factoring $0 \le x < 2\pi$:

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

$\sin x \cos x = 2\cos x$

*Be careful with the tangent ratio!

$\tan x \sin x + \tan x = 0$

Solve by factoring and state the general solution:

$\cos^2 x - \cos x - 2 = 0$ $\qquad$ $2\sin^2 x - 3\sin x + 1 = 0$

Some equations are very difficult to solve algebraically:

There are two methods for solving graphically that are commonly used,

1) method of intersection 2) intercept method

I prefer the intercept method because it is easier to set up your window

1) Set up the equation
2) 2^{nd} Trace (calc)
3) 2: zeros
4) window

x → should match the domain

y → can be -1 to 1 (anything that shows the x-axis)

Ex.

Solve graphically $0 \le x < 2\pi$:

$\cos^3 x - 3\cos x + 1 = 0$ $\qquad$ $\sin x = \dfrac{1}{x}$

Solving graphically with exact values:

It is possible to solve exactly with the graphing calculator. The adjustment we have to make is on the x-scale:

Let's look at the special angles:

$0, \dfrac{\pi}{6}, \dfrac{\pi}{4}, \dfrac{\pi}{3}, \dfrac{\pi}{2}, \ldots$ What is the LCD of the special angles?

If we set the x-scale to the LCD, then we can see which 'tick' mark the graph crosses at.

Ex.

Solve exactly $0 \le x < 2\pi$

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

Practice

1) Solve:

$\cos^2 x = \frac{3}{4}$ $\qquad$ $\sin^2 x - \frac{1}{4} = 0$ $\qquad$ $4\cos^2 x - 1 = 0$

2) Solve:

$2\sin^2 x + \sin x = 0$ $\qquad$ $\sin^2 \theta = 2\sin\theta$

$2\cos^2 x = \sqrt{2}\cos x$ $\qquad$ $\tan^2 x + \sqrt{3}\tan x = 0$

$\cos x \tan x - \cos x = 0$

3) Solve exactly where possible, otherwise to 2 decimal places:

$\sin^2 x - \sin x - 2 = 0$ $\qquad$ $\cos^2 x - 6\cos x + 5 = 0$

$2\sin^2 x - \sin x - 1 = 0$ $\qquad$ $2\cos^2 x + 3\cos x = -1$

$2\cos^2 \theta + 5\cos\theta - 3 = 0$

4) Solve with a graphing calculator to 2 decimal places for the domain given:

$2\sin x = \cos 3x,$ where $0 \le x < 2\pi$ $\qquad$ $\sin x - x^2 = \log x \left(0 \le x < \pi\right)$

5) Solve exactly using your graphing calculator $\left(-\pi \le x < \pi\right)$:

$\sqrt{3}\tan^2 x + \sqrt{3}\tan x + \tan x + 1 = 0$ $\qquad$ $2\cos^2 x - \sqrt{2}\cos x + 2\cos x - \sqrt{2} = 0$

HW: MC – 9,14,16,27,37,43,50,55,57,62,69 WR – 1,5