

## Trigonometric Equations

**Ex 1.**

Solve  $2 \sin x + 1 = 0$  over the interval  $[0, 2\pi)$ .

What are *all* the solutions of  $2 \sin x + 1 = 0$ ?

**Ex 2.**

Solve  $\sin x \tan x = \sin x$  over the interval  $[0, 2\pi)$ .

**Ex 3.**

Find all solutions of  $\cot x (\cot x + 3) = 1$ .

**Ex 4.**

Solve  $\tan x + \sqrt{3} = \sec x$  over the interval  $[0, 2\pi)$ .

**Solving Trig Equations** - the book (p.265) has the following helpful guidelines

1. Decide whether the equation is linear or quadratic in form.
2. If there's only one trig function, solve the equation for that function.
3. If there are more one trig function, rearrange the equation so that one side equals 0. Then try to factor and set each factor equal to 0 to solve.
4. If the equation is quadratic in form, but not factorable, use the quadratic formula. Check that solutions are in the desired interval.
5. Try using identities to change the form of the equation. It may be helpful to square each side of the equation first. In this case, check for extraneous solutions.

**Ex 5.**

Find all solutions of  $2 \sin 4x = -\sqrt{3}$ . Then list the solutions in the interval  $[0, 2\pi)$ .

**Ex 6.**

Solve  $\cos 2x = \cos x$  over the interval  $[0, 2\pi)$ . Then find all solutions.

**Ex 7.**

Solve  $4 \sin 2x \cos 2x = -\sqrt{3}$  over the interval  $[0, 2\pi)$ .

**Ex 8.**

Solve  $\cot 2x - \csc 2x = 1$  over the interval  $[0, 2\pi)$ .

For the following trig equations, let's get practice just taking the first steps...

$$2 \cos x - 1 = \sec x$$

$$\cos^2 x = \sin^2 x + 1$$

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

$$4 \cos^2 x + 3 \cos x = 1$$

$$\sec^2 x = 2 \tan x + 4$$

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

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

$$\cos x = \sin^2 \frac{x}{2}$$

---

**Practice**

---

1. For each trig equation, find all solutions, and then list the solutions in the interval  $[0, 2\pi)$ .

a)  $\cos 2x = \sin x$

b)  $2 \cos \frac{x}{3} - \sqrt{2} = 0$

c)  $3 \tan x \sin^2 x - \tan x \sin x - 2 \tan x = 0$  (Hint: factor out a  $\tan x$  first, then factor further)

d)  $2 \sin x = 1 - 2 \cos x$

Q: What is the word that everybody always says wrong?