5.3 Solving Trig Equations

Example 1 - Solving a Trig Equation

$$2 \sin x - 1 = 0$$
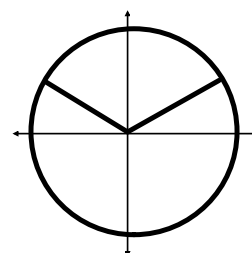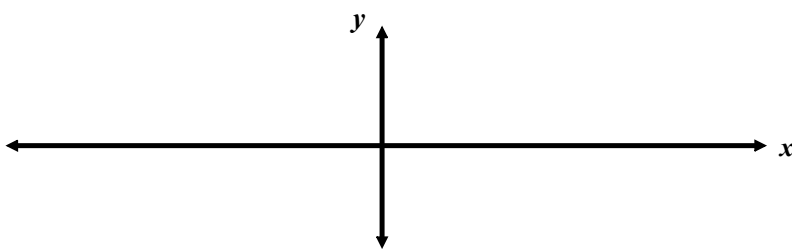$$2 \sin x = 1$$
$$\sin x = 1/2$$

To solve for x, note that *sin x = 1/2* has solutions at *x = π/6, and x = 5π/6*
on the interval *[0, 2π].* However, there are infinitely many solutions.

General Solutions

$$x = π/6 + 2nπ \qquad \text{and} \qquad x = 5π/6 + 2nπ$$

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Example 2 - Collecting Like Terms

Find all solutions of $\sin x + \sqrt{2} = -\sin x$ **on the interval** *[0, 2π]*

Example 3 - Extracting a Square Root
   Solve

$$3 \tan^2 - 1 = 0$$

When 2 or more function eccur in the same equation,
collect all the terms on one side ant try to separate the functions by factoring or by using identities.

Example 4 - Factoring

$$cot\ x\ cos^2\ x = 2\ cot\ x$$

Equations of a Quadratic Type

Quadratics in sin x

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

$2 (\sin x)^2 - \sin x - 1 = 0$

Quadratics in sec x

$\sec^2 - 3 \sec x - 2 = 0$

$(\sec x)^2 - 3 \sec x - 2 = 0$

Example 5 - Factoring an Equation of Quadradic Type

Find all solutions in the interval [0, 2π]

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

Example 6 - Rewriting with a Single Trig Function

    Solve

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

Example 7 - Squaring and Converting to a Quadratic Type

Find all solutions in the interval $[\,0\,,\,2\pi\,]$

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

Example 8 - Functions of Multiple Angles

Solve

$$2 \cos 3t - 1 = 0$$

Example 9 - Functions of Multiple Angles

   Solve

$$3 \tan x/2 + 3 = 0$$

Example 10- Using Inverse Functions
Find all solutions of:

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

Example 11 - Approximating Solutions

Approximate the solutions in the interval $[-\pi, \pi]$

$$x = 2 \sin x$$

Example 12 - Surface Area of a Honeycomb

The S.A. of a honeycomb is given by the equation

$$s = 6hs + \frac{3}{2} s^2 \left(\frac{\sqrt{3} - \cos x}{\sin x} \right) \qquad 0 < x < 90^0$$

h = 2.4 **inches**
s = *.75* **inches**

a.) What value of *x* gives a surface area of *12* square inches ?

b.) What value of *x* gives a minimum surface area ?