






Math 1060 ~ Trigonometry

13 Solving Trigonometric Equations

Learning Objectives

In this section you will:

- Use inverse trigonometric functions to solve right triangles.
- Use inverse trigonometric functions to solve for angles in trigonometric equations.
- Write complete real solutions to equations containing a single trigonometric function.
- Evaluate exact solutions in the interval $[0, 2\pi)$.
- Use inverse trigonometric functions to solve real-world applications.

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

$$\sin 2u = 2 \sin u \cos u$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

The inverse functions allow us to calculate angles in a right triangle, given two of the sides.

Ex 1: Determine the acute angles in a 3-4-5 right triangle.

Ex 2: If a 50-meter rope is attached to the top of a 20-meter pole for a tight-rope event, what angle does the rope make with the ground?

We can also solve trigonometric equations for angles in radians.

Remember: $x = \sin^{-1}(a)$ returns a single, principal value and $\sin x = a$ will have an infinite number of solutions, if defined.

Sample: Solve for x .

$$x = \sin^{-1}\left(-\frac{1}{2}\right) \qquad \sin x = -\frac{1}{2}$$

Ex 3: Solve these for x , where x is in radians. State the solution on the interval $[0, 2\pi)$ and then state the general solution for all angles which provide a solution to the equation.

a) $\sqrt{2}\sin x - 1 = 0$

b) $\sec^2 x = 4$

Ex 4: State the general solution for each of these.

a) $\tan^2 x - 3 = 1$

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

Ex 5: State all radian values where the line $y = 2$ intersects with the function $y = \sec x$.