

Things to Know about Trig

- Be familiar with the unit circle.
- Know the graphs of sine, cosine, and tangent.
- Know the values of sine, cosine, and tangent at 0 , $\pi/6$, $\pi/4$, $\pi/3$, $\pi/2$, etc.
- Know the basic trig identities.
- Know how to differentiate trigonometric and inverse trigonometric functions.
- Know how to solve trigonometric equations.
- Know how to apply trigonometry to optimization and related rates problems.
- Know how to solve triangles and how to use the Law of Sines and the Law of Cosines.

Unit Circle Problems

A bug is crawling around a circle with equation $x^2 + y^2 = 4$. It starts at the point $(2, 0)$ and proceeds counterclockwise. It carefully measures the distance that it has travelled and stops crawling after 7 cm.

- (a) Through what angle in degrees has the bug crawled?
- (b) What are the approximate x and y coordinates of the bug?
- (c) Imagine drawing a line from the bug's current position through the origin. What is the slope of this line?

Solving Triangles

The height of the Bank of America Tower in Seattle is 954 feet. Looking up from the base of the Bank of America Tower, the angle of elevation to the top of the Seafirst Tower (now the 1000 4th Avenue Tower) is 37° . From the base of the Seafirst Tower, the angle of elevation to the top of the Bank of America Tower is 53° .

- What is the distance between the two towers?
- What is the height of the Seafirst Tower

Sinusoidal Functions

The London ferris wheel has a diameter of 500 feet and completes one revolution in 20 minutes.

- (a) Find the rate (in degrees per minute) that the ferris wheel is rotating.
- (b) Let t , the time in minutes, be zero when you are at the 6 o'clock position. Write θ , measure from the 3 o'clock position, as a function of t .
- (c) Find a formula for the ferris wheel function, $h(t)$, giving your height above the ground.
- (d) Graph $h(t)$. What is the period, the balance value, and the amplitude?

Trigonometry and Related Rates Problems

A rocket is launched vertically and is tracked by a radar station located on the ground 5 miles from the launch pad. Suppose that the elevation angle θ of the line of sight to the rocket is increasing at 3° per second ($\pi/60$ radians per second) when $\theta = 60^\circ$ ($\pi/3$ radians). Use related rates to find the velocity of the rocket at this instant.

Solving Trigonometric Equations

Solve the following trigonometric equations for $0 \leq \theta \leq 2\pi$.

(a) $2 \sin t \cos t - \cos t = 0$

(b) $\sin 2t - \cos t = 0$

(c) $2 \cos^2 t = \sin t + 1$

Working with Inverse Trig Functions

Find the derivative of $y = \arctan x$.