

LEC3 – Trigonometry

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Example:

Near a busy highway, the concentration of air pollution P (in ppm) is a function of the distance x (in meters) from the road, as illustrated in the graph.

*Read the units of x & y to determine the meaning

*Use HLT to determine if function invertible

*Look at graph where the graph is at $y=100$

*Find where graph of inverse is ≤ 50

1. What is $P(100)$ and what does it mean?

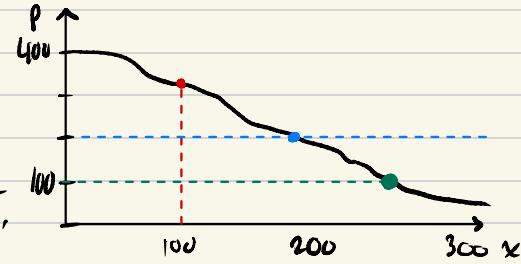
$P(100) \approx 300$ ppm of pollution at a distance of 100m

2. Is P invertible? Why or why not?

Yes, P is invertible because it passes the HLT, therefore, it is one-to-one.

3. Approximately what is $P^{-1}(100)$ and what does it mean?

$P^{-1}(100) \approx 250$. The meaning of this is 250m for 100ppm of pollution

**Example:**

Suppose you work at a government policy office and you are tasked with setting a policy for daycares. If pollution should not be more than 50 ppm near daycares, what is the shortest distance a daycare can be from this highway?

≈ 300 m because $P(300) \approx 50$ ppm OR $P^{-1}(50) = 300$ $\{x | x \geq 300\}$

Warm Up

Which of the following are TRUE

1. $\sin^n(\theta) = (\sin(\theta))^n$ $n = 1, 2, 3, \dots$ **TRUE** \Rightarrow This is a convention to make writing trig easier
2. $\sin^{-1}(\theta) = (\sin(\theta))^{-1}$ **FALSE** \Rightarrow \sin^{-1} means inverse sin, which does not equal $\frac{1}{\sin \theta}$

$$\arcsin(\theta) \neq \frac{1}{\sin \theta}$$

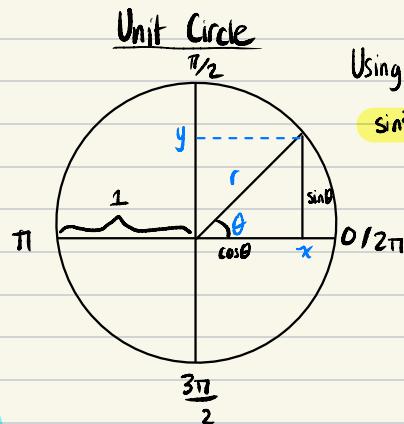
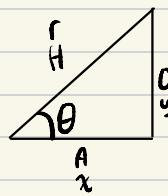
Unit circle: A circle with radius 1 unit that can be used to map out the trigonometric ratios

Basics of Trigonometry

$$\sin \theta = \frac{y}{r} = \frac{y}{\sqrt{x^2 + y^2}}$$

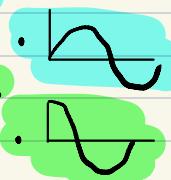
$$\cos \theta = \frac{x}{r} = \frac{x}{\sqrt{x^2 + y^2}}$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{y}{x}$$



Properties of: $\cos \theta$ $\sin \theta$

- This function is odd
- Its graph is symmetric about the y-axis
- At $x=0$ its value is one
- Its graph crosses the x-axis at $x=\pi$



NOTE: We always use RADIANS in MAT135