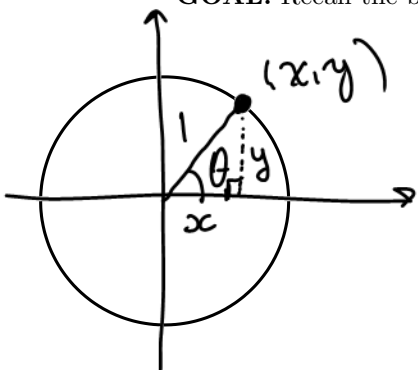


Lecture 1: Review of Precalculus

GOAL: Recall the basic properties of trig, exponential, and logarithmic functions.



Trig Functions

$$\sin \theta = \frac{\text{opp}}{\text{hyp}} = \frac{y}{1} = y$$

$$\cos \theta = \frac{\text{adj}}{\text{hyp}} = \frac{x}{1} = x$$

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

Reciprocal Functions

$$\frac{1}{\sin \theta} = \csc \theta$$

$$\frac{1}{\cos \theta} = \sec \theta$$

$$\frac{1}{\tan \theta} = \cot \theta$$

Pythagorean Identity

$$x^2 + y^2 = 1$$

$$[\sin \theta]^2 = \sin^2 \theta$$

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

Ex 1

If $\sin \theta = \frac{5}{13}$ and θ is in the 2nd quadrant
What is the value of the other trig functions?
Know $\sin \theta = \frac{5}{13}$. Need to know $\cos \theta$

Since

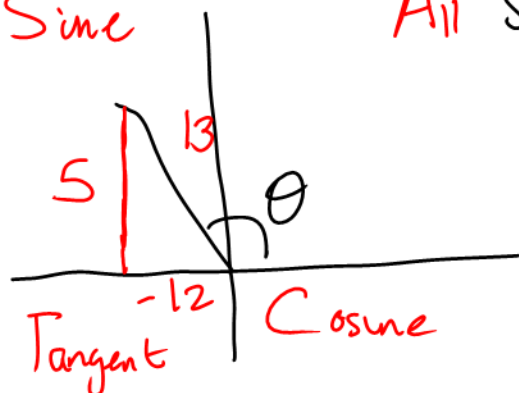
$$\text{All } \sin^2 \theta + \cos^2 \theta = 1$$

$$\left(\frac{5}{13}\right)^2 + \cos^2 \theta = 1$$

$$\frac{25}{169} + \cos^2 \theta = 1$$

$$\cos^2 \theta = 1 - \frac{25}{169} = \frac{144}{169}$$

$$\cos \theta = \pm \sqrt{\frac{144}{169}} = \pm \frac{12}{13}$$



Since θ is in the second quadrant, $\cos \theta = -\frac{12}{13}$

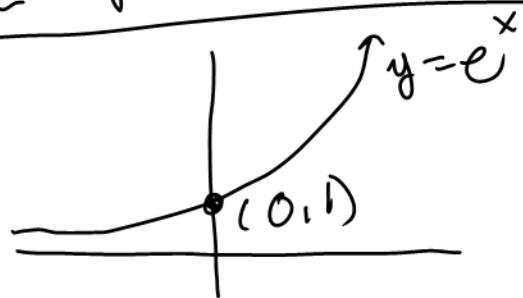
$$\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{5/13}{-12/13} = -5/12$$

$$\csc \theta = \frac{1}{\sin \theta} = \frac{1}{5/13} = 13/5$$

$$\sec \theta = \frac{1}{\cos \theta} = \frac{1}{-12/13} = -13/12$$

$$\cot \theta = \frac{1}{\tan \theta} = \frac{1}{-5/12} = -12/5$$

Exponential Functions



Properties

$$\textcircled{1} e^0 = 1$$

$$\textcircled{2} e^x > 0$$

$$\textcircled{3} e^a e^b = e^{a+b}$$

$$\textcircled{4} e^a / e^b = e^{a-b}$$

$$\textcircled{5} [e^a]^b = e^{ab}$$

Ex 2

$$\textcircled{1} e^x e^{-5} = e^{x-5}$$

$$\textcircled{2} \frac{e^{3x}}{e^{5x}} = e^{3x-5x} = e^{-2x} = \frac{1}{e^{2x}}$$

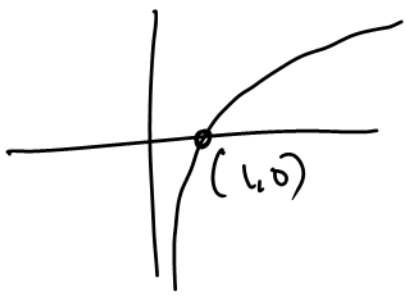
$$\textcircled{3} (e^x)^2 = e^{2 \cdot x} = e^{2x}$$

~~e^{x^2}~~

$$\textcircled{4} \frac{e^{2x} e^3}{e^x} = \frac{e^{2x+3}}{e^x} = e^{(2x+3)-x} = e^{x+3}$$

Logarithms

$y = \ln(x) = \log_e(x)$ = the exponent such that $e^y = x$



Properties

$$\textcircled{1} \ln(1) = 1$$

$$\textcircled{2} \ln(ab) = \ln(a) + \ln(b)$$

$$\textcircled{3} \ln\left(\frac{a}{b}\right) = \ln(a) - \ln(b)$$

$$\textcircled{4} \ln(a^b) = b \ln(a)$$

Ex 3

$$\textcircled{1} \ln(e) = 1$$

$$e^{\square} = e$$

$$\textcircled{2} \ln(e^{2x}) = 2x \ln e = 2x$$

Ex 4 Solve for x in the equation

$$\ln(x^2) = 5$$

$$e^{\ln(x^2)} = e^5$$

$$x^2 = e^5$$

$$x = \pm \sqrt{e^5}$$

$$= \pm (e^5)^{\frac{1}{2}} = \pm e^{\frac{5}{2}}$$

e^x and $\ln x$
are inverses
 $e^{\ln(x)} = x$

Exit Ticket (How I'm taking attendance)

- ① Name and Class time [2:30]
- ② Freshman / Sophomore / Junior / Senior ?
- ③ Have you taken a calculus Class before ?
- ④ Rate your math capabilities from 1 to 10.
Is there anything specific you struggle with?
- ⑤ Is there anything else I should know about ?