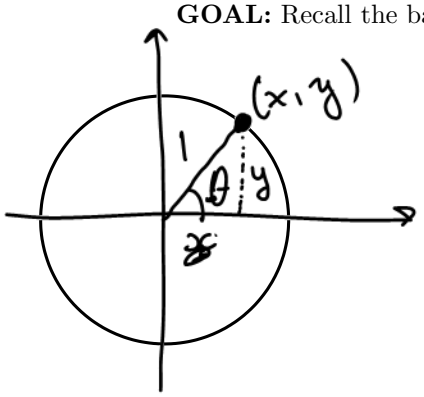
GOAL: Recall the basic properties of trig, exponential, and logarithmic functions.



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

$$\frac{1}{\sin\theta} = \csc\theta \qquad \frac{1}{\cos\theta} = \sec\theta \qquad \frac{1}{\tan\theta} = \cot\theta$$

Pythagorean Identity

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

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

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

Ex 1 If $\sin\theta = \frac{5}{13}$ and θ is in the 2nd quadrant, what's the value of the remaining trig functions?

$\sin\theta = \frac{5}{13}$. Need to find $\cos\theta$

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

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

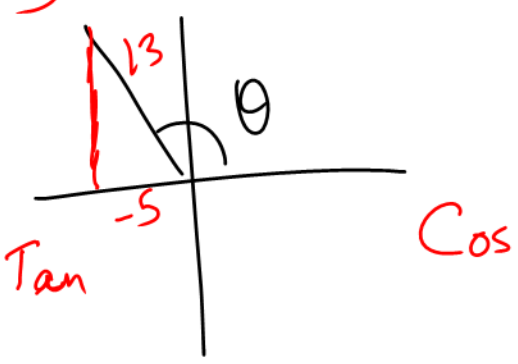
$$\frac{25}{169} + \cos^2\theta = 1$$

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

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

Sine

All



Tan

Cos

Since θ is in the 2nd Quadrant, $\cos\theta = -\frac{12}{13}$

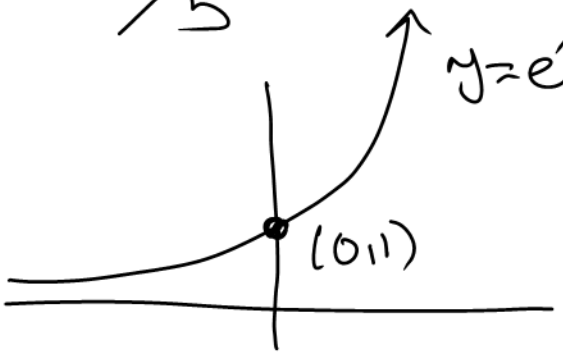
$$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{5/13}{-12/13} = -5/12$$

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

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

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

Exponential Functions



Properties

1. $e^0 = 1$
2. $e^x > 0$ for all x
3. $e^a e^b = e^{a+b}$
4. $\frac{e^a}{e^b} = e^{a-b}$
5. $[e^a]^b = e^{ab}$

Ex 2

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

$e^{-a} = \frac{1}{e^a}$

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

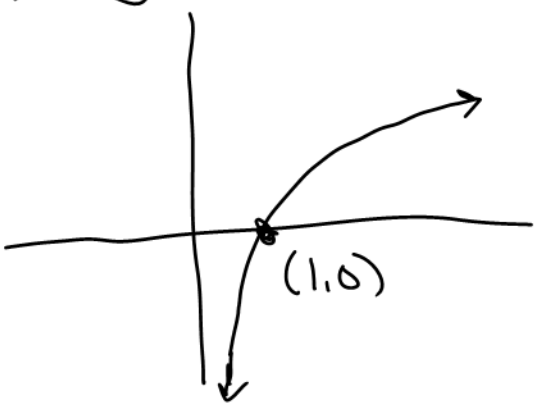
$\neq e^{x^2}$

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

① $\ln(1) = 0$

② $\ln(ab) = \ln(a) + \ln(b)$

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

④ $\ln(a^b) = b \ln a$

$e^{\square} = e$

Ex 3

① $\ln(e) = 1$

② $\ln(e^k) = k \ln e = k$

Ex 4

Solve for x in

$\ln(x^2) = 5$

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

$x^2 = e^5$

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

e^x and $\ln(x)$ are inverses

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

Exit Ticket (How I'm taking attendance)

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