Micro-lesson on the unit circle.

$r=1$

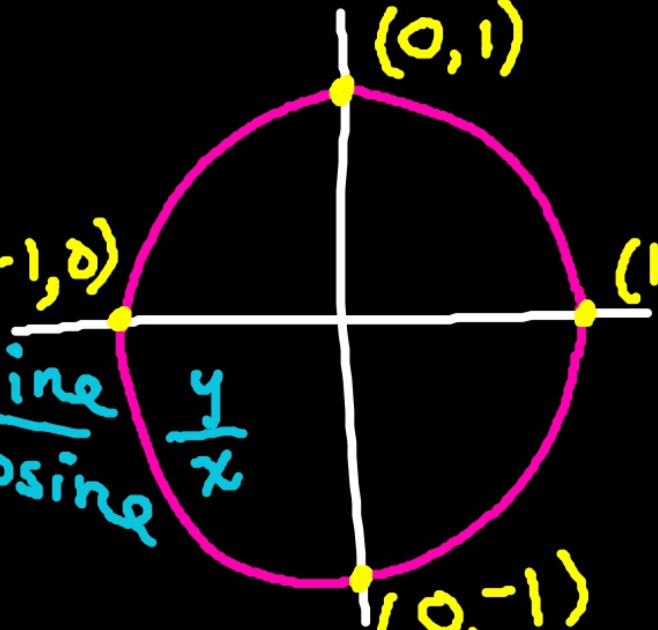
Mode: radian

1) Please find the output for sin(π) on your calculator

$\sin(\pi/2) = 1$

Sine = y
cosine = x

tangent = $\frac{\text{sine}}{\text{cosine}}$ $\frac{y}{x}$



$C = 2\pi r$
$C = 2\pi(1)$

360°; 2π
0°; 0π

Sine
vertical displacement along a rotation

SOH
CAH
TOA

Micro-lesson on logarithms

1) The base is the base.

gnat

$2^x = 7$

$\log_2 7 = x$

Euler's number $= \sim 2.7 = e$
"Oilers" "natural"

$\log_e$

$\downarrow$

$\ln$

logarithm

- solves unknown exponents
- inverse

$y \leftarrow = x$
$\rightarrow$

Today's learning objective:

By the end of class, I will be able to calculate problems involving special derivatives.

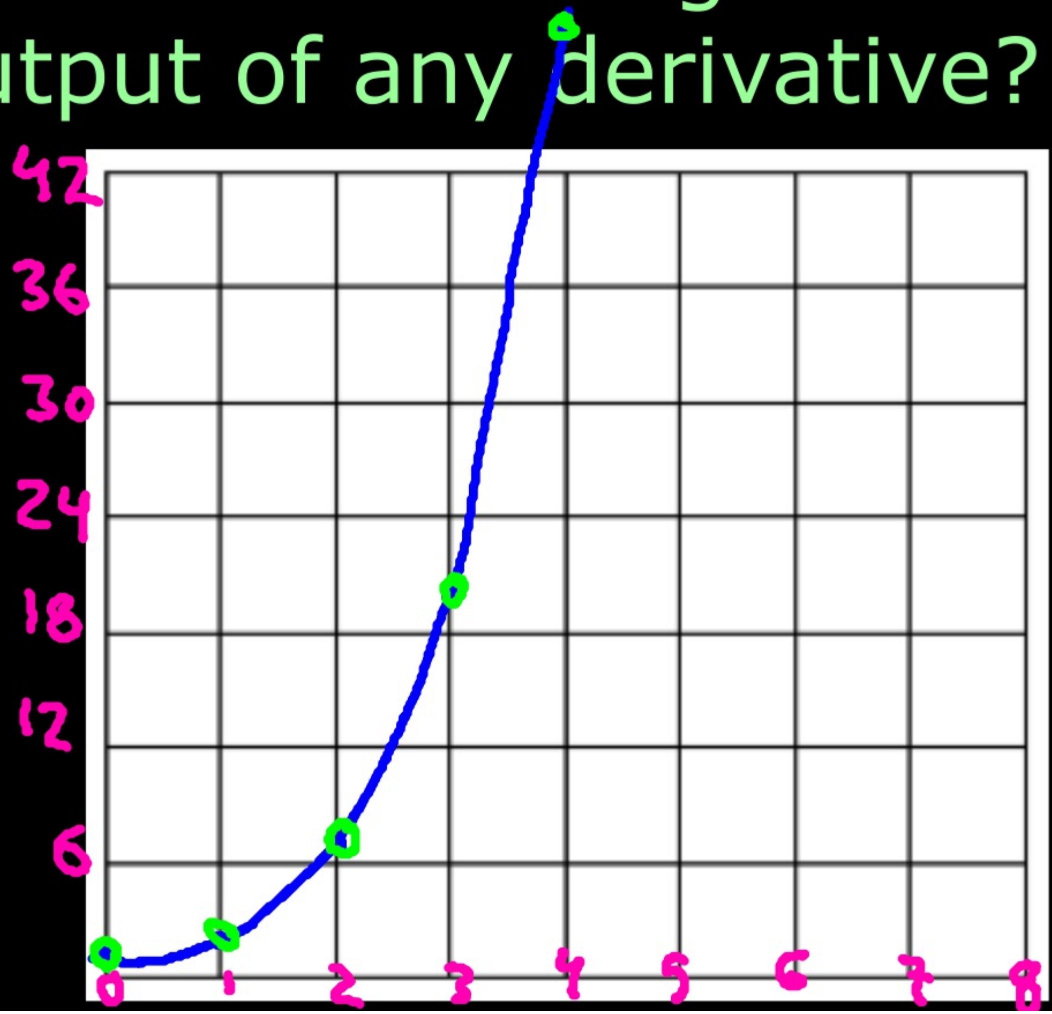
$$(\cos 16)^2 = \cos^2 16$$

Today's language objective:

Natural number
Natural log
Trigonometry

1) Please obtain a graphing board or graphing paper & two different colors

2) Discuss with a neighbor: what is the output of any derivative?



$f(x) = e^x$

x min = -2
max = 20

y min = -5
y max = 40

Derivative of x^n	$f(x)=x^n \Rightarrow f'(x)=nx^{n-1}$
Derivative of $\sin x$	$f(x)=\sin x \Rightarrow f'(x)=\cos x$
Derivative of $\cos x$	$f(x)=\cos x \Rightarrow f'(x)=-\sin x$
Derivative of $\tan x$	$f(x)=\tan x \Rightarrow f'(x)=\dfrac{1}{\cos^2 x}$
Derivative of e^x	$f(x)=e^x \Rightarrow f'(x)=e^x$
Derivative of $\ln x$	$f(x)=\ln x \Rightarrow f'(x)=\dfrac{1}{x}$
Chain rule	$y=g(u),\ u=f(x) \Rightarrow \dfrac{dy}{dx}=\dfrac{dy}{du}\times\dfrac{du}{dx}$

$f(x) = \sin(4x^2 - 3)$

find $f'(x)$

$f(x) = \sin(x)$

$f'(x) = \cos(x)$

$\cos(4x^2-3)$

$\boxed{f'(x) = 8x\cos(4x^2-3)}$

$f(x) = \cos x$

$f'(x) = -\sin x$

Challenge: $c(x) = \cos(3x^3 - 2x^2)$

find $c'(x)$

$-\sin(3x^3-2x^2)$

$-(9x^2-4x)\sin(3x^3-2x^2)$

$f(x) = \ln(3x^3 - 5)$

find $f'(x)$

$$\frac{1}{3x^3-5} \cdot \frac{9x^2}{1}$$

$$f'(x) = \frac{9x^2}{3x^3-5}$$

$f(x) = \ln x$

$f'(x) = \frac{1}{x}$

$f(x) = \tan x$

$f'(x) = \frac{1}{\cos^2 x}$

Challenge: Find $f'(\pi)$ for $f(x) = \tan 5x$

$$\boxed{\frac{5}{\cos^2 5x}} = \frac{1}{\cos^2 5x} \cdot \frac{5}{1}$$

$$\boxed{5} = \frac{5}{\cos^2(5\pi)} = \frac{5}{(-1)^2}$$

$f(x) = e^{\cos x}$

find $f'(x) =$

$-\sin x \cdot e^{\cos x}$

Challenge: $g(x) = \ln(\cos x)$

find $g'(x)$

$-\tan x = \frac{-\sin x}{\cos x}$ $\frac{1}{\cos x} \cdot \frac{-\sin x}{1}$

$f(x) = e^x$

$f'(x) = e^x$

$f(x) = \cos x$

$f'(x) = -\sin x$

$f(x) = \ln x$

$f'(x) = \frac{1}{x}$

$f(x) = \tan x$

$f'(x) = \frac{1}{\cos^2 x}$

$h(x) = e^{4x}$

find $h'(x)$

e^{4x}

$\boxed{4e^{4x}}$

$f(x) = \tan x$

$f'(x) = \frac{1}{\cos^2 x}$

$f(x) = e^x$

$f'(x) = e^x$

$f(x) = \ln x$

$f'(x) = \frac{1}{x}$

Challenge: $j(x) = \ln(5x^3) + 4x^1$

$1 \cdot 4$

Show that $j'(x) = 3/x + 4$

$$\frac{1}{5x^3} \cdot \frac{15x^2}{1} = \frac{15x^2}{5x^3} = \frac{3}{x} + 4$$

$$h(x) = \underbrace{e^{8x^2}} + \underbrace{4\tan 4x^2}$$

Find $\frac{dy}{dx} = 16xe^{8x^2} + \frac{4 \cdot 8x}{\cos^2(4x^2)}$

$$16xe^{8x^2} + \frac{32x}{\cos^2(4x^2)}$$

$f(x) = e^x$

$f'(x) = e^x$

$f(x) = \tan x$

$f'(x) = \frac{1}{\cos^2 x}$

b) What's the gradient of the tangent at

$$\frac{dy}{d(2)} =$$