Unit 3 Day 3 Notes

Guided Notes 3.5 -...

Inserted from: <file://H:\Calculus\Units 2 - 6 Derivatives\Unit 3 Derivative Rules\Guided Notes 3.5 - 3.6.docx>

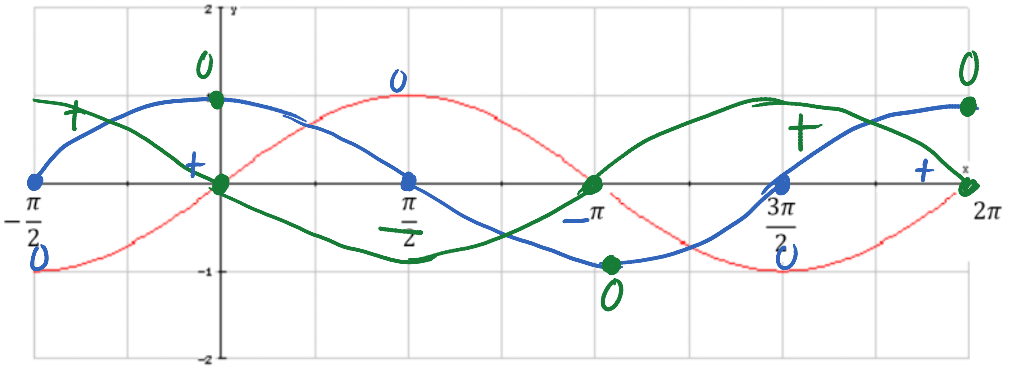
$\star \sin^2 x + \cos^2 x = 1$

AB Calculus Unit 3 Day 3
3.5 - 3.6 Guided Notes

$\star \sin(2x) = 2\sin x \cos x$

Name _____

Exploration: Below is the graph of y = sin (x).

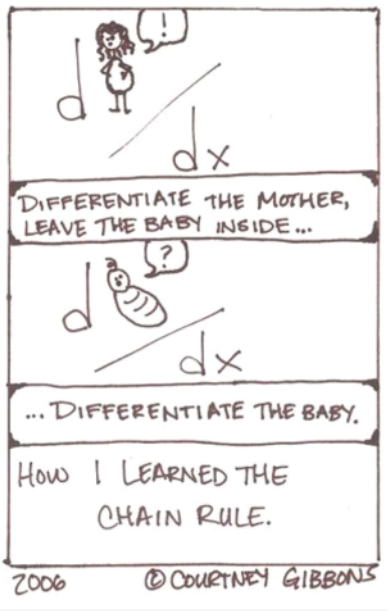


#1 Draw the derivative of y = sin (x) on the same graph above. Label it y'.

#2 Identify y' = $\cos x$

#3 (challenge) Draw the derivative of y' on the graph above.

#4 (challenge) Identify y'' = $-\sin x$



Trig Derivatives (Memorize!!!)

$$\frac{d}{dx}\sin x = \cos x \qquad \frac{d}{dx}\csc x = -\csc x \cot x$$
$$\frac{d}{dx}\cos x = -\sin x \qquad \frac{d}{dx}\sec x = \sec x \tan x$$
$$\frac{d}{dx}\tan x = \sec^2 x \qquad \frac{d}{dx}\cot x = -\csc^2 x$$

Ex 1: GUIDED EXAMPLE: Find the derivative:

a) $y = \sin(3x - 1)$ Mama → sin (baby) Baby → 3x – 1

y' = $\cos(3x-1) \cdot 3 = 3\cos(3x-1)$

b) $y = \sin^2 x$ Rewrite: $y = (\sin x)^2$ Mama → $(\ \ )^2$ Baby → $\sin x$

y' = $2(\sin x) \cdot \cos x = 2\sin x \cos x = \sin(2x)$

$\cos x^2 \neq \cos^2 x$

Ex 2: Find the derivative:

a) $y = \sin(x^2)$ $y' = \cos(x^2) \cdot 2x = 2x\cos x^2$

b) $y = \sec(5x - 1)$ $y' = \sec(5x-1)\tan(5x-1) \cdot 5$

c) $y = \frac{\sin x}{\cos x}$ $y' = \frac{\cos x \cdot \cos x - (\sin x) \cdot -\sin x}{\cos^2 x} = \frac{\cos^2 x + \sin^2 x}{\cos^2 x} = \frac{1}{\cos^2 x} = \sec^2 x$

$y = \tan x$ $y' = \sec^2 x$

d) $y = x^2 \cos x$

$y' = x^2 \cdot -\sin x + \cos x \cdot 2x = -x^2 \sin x + 2x\cos x$

e) $f(x) = \tan(x - x^3)$

$f'(x) = \sec^2(x - x^3) \cdot (1 - 3x^2)$

Ex 3: Find y'' if $y = \tan(2x^3)$

$y' = \sec^2(2x^3) \cdot 6x^2 = 6x^2 \sec^2(2x^3) = 6x^2 \cdot [\sec(2x^3)]^2$

$y'' = 6x^2 \cdot 2(\sec(2x^3))\sec(2x^3)\tan(2x^3) \cdot 6x^2 + [\sec(2x^3)]^2 \cdot 12x$

Ex 4: Find the slope of the line tangent to the curve $y = \sin^5 x$ at $x = \frac{\pi}{3}$.

derivative $y = (\sin x)^5$ $y' = 5(\sin x)^4 \cdot \cos x$

$y'\left(\frac{\pi}{3}\right) = 5\left(\sin\frac{\pi}{3}\right)^4 \cdot \cos\frac{\pi}{3} = 5\left(\frac{\sqrt{3}}{2}\right)^4 \cdot \frac{1}{2} = \frac{45}{32}$

CHALLENGE: Find the derivative:

a) $f(x) = \left(\frac{x+1}{x^2}\right)^3$

b) $R = w^2 \sin(3w)$

c) $y = \sin^2(5x - 1)$

d) $g(x) = \sin(x^2)\sec(2x)$