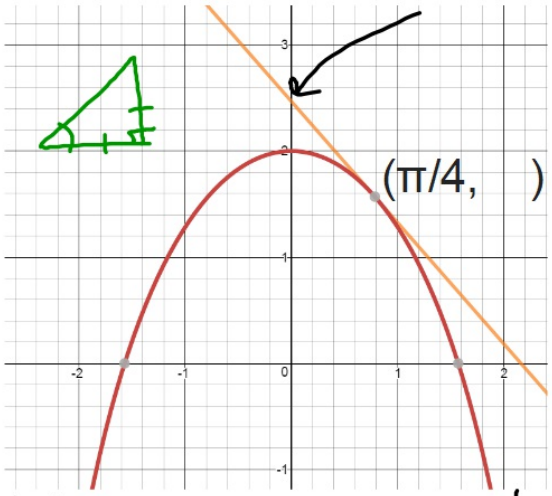
Warm up : 1 Write the equation of this line



$y = \frac{2x}{\tan x}$

$y_1 = \frac{2(\frac{\pi}{4})}{\tan(\frac{\pi}{4})} = \frac{\frac{\pi}{2}}{1} = \frac{\pi}{2}$

$y - \frac{\pi}{2} = \square(x - \frac{\pi}{4})$

$f: 2x \quad f': 2$

$g: \tan x \quad g': \sec^2 x$

$\frac{dy}{dx} = \frac{2\tan x - 2x\sec^2 x}{\tan^2 x}$

$\left.\frac{dy}{dx}\right|_{x=\frac{\pi}{4}} = \frac{2(1) - 2(\frac{\pi}{4})\sec^2(\frac{\pi}{4})}{(\tan\frac{\pi}{4})^2}$ ($\pi/2$)

$2 - \frac{\pi}{2}\sec^2(\frac{\pi}{4})$ (1)

$\left[\frac{1}{\cos(\frac{\pi}{4})}\right]^2$

$\left[\frac{1}{\frac{\sqrt{2}}{2}}\right]^2 \rightarrow \left[\frac{2}{\sqrt{2}}\right]^2$

$2 \leftarrow \frac{4}{2}$

$2 - \frac{\pi}{2}(2)$

$2 - \pi$

$y - \frac{\pi}{2} = (2-\pi)(x - \frac{\pi}{4})$

$y - 1.57 = -1.146(x - \frac{\pi}{4})$

Which of these doesn't belong?

$f(x) = x^2 \sin(x)$

$h(x) = \sin(x^2)$

$g(x) = \dfrac{\sin x}{x^2}$

$j(x) = x^2 - \sin x$

The Chain Rule (very important!!!)

What is the derivative of $y=\sin(x^2)$? Is it...$y'=\cos(2x)$??

https://www.youtube.com/watch?v=DoZEpCqeYEU

https://www.desmos.com/calculator/d68amu80pp

https://youtu.be/YG15m2VwSjA?t=8m42s

https://youtu.be/S0_qX4VJhMQ?t=2m36s

So, no, the derivative is not so simple.

First, note that $y=\sin(x^2)$ is a *composite function*

REVIEW

Suppose $f(x) = x^2$ and $g(x)=5x-3$

1. Find $f(g(x))$ (don't simplify) $(5x-3)^2$
2. Simplify f(g(x)) $25x^2-30x+9$
3. Find $\frac{d}{dx} f(g(x))$ $50x-30$

So, if $f=x^2$ and $g=5x-3$

$f(g(x)) = (5x-3)^2 = 25x^2-30x+9$

Derivative of f(g(x)) would be 50x - 30

$50x-30$

$10(5x-3)$

$2\cdot 5(5x-3)^1$

$2(5x-3)^1\cdot 5$

The Chain Rule

$$\frac{d}{dx}\left[f(g(x))\right] = f'(g(x)) \cdot g'(x)$$

www.alamy.com - BFA0K4

Find f '(x) for $f(x) = (5x-3)^2$

$\frac{d}{dx} f(g(x)) = f'(g(x)) \cdot g'(x)$

$f' = 2(5x-3)^1 \cdot 5$

$= 10(5x-3)$

Find h '(x) for $h(x) = (5x-3)^{100}$

$h'(x) = 100(5x-3)^{99} \cdot 5$

$500(5x-3)^{99}$

Find dy/dx where $y = \sec(3x^2+2)$

$\frac{d}{dx} \sec(3x^2+2)$

$\sec(3x^2+2)\tan(3x^2+2)\,6x$

$\frac{d}{dx} \sec(\blacksquare) = \sec(\blacksquare)\tan(\blacksquare)$

Differentiate: $y=[\cos(4x-3)]^{50}$

$$\frac{dy}{dx} = 50[\cos(4x-3)]^{49}(-\sin(4x-3))(4)$$

$$-200\sin(4x-3)[\cos(4x-3)]^{49}$$

HW due Friday

frontside: #1-12 pick 10

~~backside: #451-467 pick any 8~~

R. Kelly - Remix to Ignition