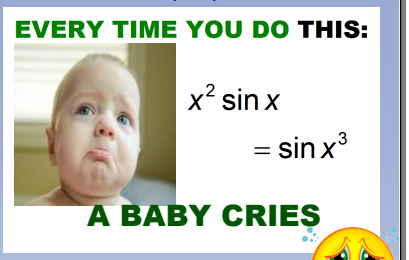
2.4 Day 3 - The Chain Rule (Trig Edition)

11/27/18

Homework:

- 2.4 C
- 2.4 PA Friday 11/30
- 2.1-2.4 Test - Wednesday 12/5

Objective: Find derivatives of trig functions using the Chain Rule.



Do Now: Find the derivative of each function.

$$f(x) = 2x^4(1-7x^5)^{10} \qquad g(x) = \left(\frac{2x-4}{x^2+1}\right)^3$$

$f'(x) = 8x^3(1-7x^5)^{10} + 2x^4 \cdot 10(1-7x^5)^9 \cdot -35x^4$

$= 8x^3(1-7x^5)^{10} - 700x^8(1-7x^5)^9$

GCF $4x^3(1-7x^5)^9$

$= 4x^3(1-7x^5)^9\left(2(1-7x^5) - 175x^5\right)$

$= 4x^3(1-7x^5)^9(2-14x^5-175x^5)$

$f'(x) = 4x^3(1-7x^5)^9(2-189x^5)$

Do Now Find the derivative of each function.

$$f(x) = 2x^4(1-7x^5)^{10}$$

$$\left(\frac{x}{2}\right)^3 = \frac{x^3}{8}$$

$$g(x) = \left(\frac{2x-4}{x^2+1}\right)^3$$

$g'(x) = 3\left(\frac{2x-4}{x^2+1}\right)^2 \left(\frac{2(x^2+1) - 2x(2x-4)}{(x^2+1)^2}\right)$

$2x^2+2-4x^2+8x$

$= \frac{3(2x-4)^2}{(x^2+1)^2} \cdot \frac{-2x^2+8x+2}{(x^2+1)^2}$

$= \frac{-2(x^2-4x-1)}{}$

$= \frac{-6(2x-4)^2(x^2-4x-1)}{(x^2+1)^4}$

Homework Questions?

$\frac{d}{dx}\sin(2x) = 2\cos(2x)$

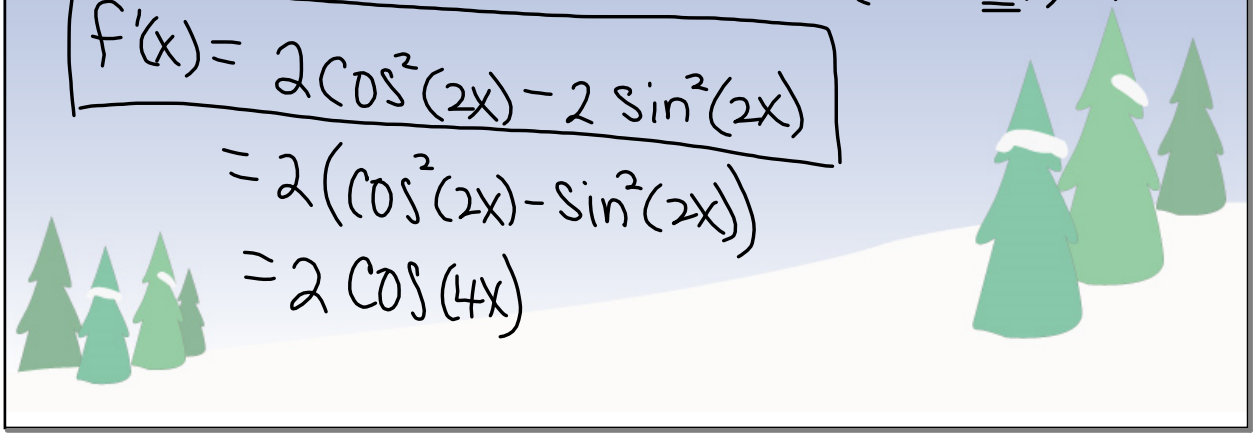
$f(x) = \sin(2x)\cdot\cos(2x)$

$f'(x) = 2\cos(2x)\cdot\cos(2x) + \sin(2x)(-\sin(2x))(2)$

$\boxed{f'(x) = 2\cos^2(2x) - 2\sin^2(2x)}$

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

$= 2\cos(4x)$



Take out yesterday's worksheet...

*What is the difference between these functions? List the functions of these compositions in order **from outside to the inside**.*

$g(x) = \cos(\pi x)^3$

cos( )✓

( )^3✓

πx✓

$g'(x) = -\sin(\pi x)^3 \cdot 3(\pi x)^2 \cdot \pi$

$g'(x) = -3\pi^3 x^2 \sin(\pi x)^3$

$f(x) = \cos^3(\pi x) = (\cos(\pi x))^3$✓

( )^3✓

cos( )✓

πx✓

$f'(x) = 3(\cos(\pi x))^2 \cdot -\sin(\pi x)\cdot\pi$

$f'(x) = -3\pi\cos^2(\pi x)\sin(\pi x)$

$h(x) = \sqrt{\cos(\pi x)} = (\cos(\pi x))^{1/2}$

( )$^{1/2}$✓

cos( )✓

πx

$h'(x) = \frac{1}{2}(\cos(\pi x))^{-1/2}\cdot -\sin(\pi x)\cdot\pi$

$h'(x) = \frac{-\pi\sin(\pi x)}{2\sqrt{\cos(\pi x)}}$

Derive: 1) Trig Power 2) Trig Function 3) Angle

Chain Rule with trig functions -
What is the order?
What is the outside function?

Derive: 1) Trig Power 2) Trig Function 3) Angle

$f(x) = \tan(4x^2+3)^5$

$\tan(\quad)$

$(\quad)^5$

$4x^2+3$

$f'(x) = \sec^2(4x^2+3)^5 \cdot 5(4x^2+3)^4 \cdot 8x$

$f'(x) = 40x\,(4x^2+3)^4 \sec^2(4x^2+3)^5$

$g(x) = \cos^4(7x^2) = (\cos(7x^2))^4$

$(\quad)^4$

$\cos(\quad)$

$7x^2$

$g'(x) = 4(\cos(7x^2))^3 \cdot -\sin(7x^2) \cdot 14x$

$g'(x) = -56x\cos^3(7x^2)\sin(7x^2)$