Friday plans:

Derivative activity
Quiz (non-calc)

limits
tangents
gradients
derivatives
chain rule
min/max

$f(x) = (3x + 1)^2$ $(3x+1)$

$9x^2 + 3x + 3x + 1$

Please simplify and then take the derivative.

Derivative of x^n	$f(x) = x^n \quad \Rightarrow \quad f'(x) = nx^{n-1}$

$(3x + 1)^7$

$7(3x+1)^6$

$f'(x) =$

$7 \cdot 3(3x+1)^6$

$21(3x+1)^6$

$9x^2 + 6x^1 + 1x^0$

$2 \cdot 9x^{2-1} + 1 \cdot 6x^{1-1}$

$18x + 6$

Today's learning objective:

By the end of class, I will be able to utilize the chain rule in order to differentiate layered functions.

$3x^1 + 1$

$1 \cdot 3x^{1-1}$

Today's language objective:

$1 \cdot 3x^0$

$1 \cdot 3 \cdot 1$

Chain rule

f'(x); $\frac{dy}{dx}$; $\frac{d}{dx}$ f(x)

Maximum

Minimum

Differentiate $f(x) = (3x + 1)^2$ using the Chain Rule

Step 1: Take the derivative of the outer function

f '(x) <incomplete> = $2(3x + 1)^1$

Step 2: Take the derivative of the inner function

f '(x) <incomplete> = $2*3(3x + 1)$

Step 3: Simplify $6(3x+1) = 18x+6$

f '(x) <completed derivative> = $6(3x + 1) = 18x + 6$

Is this the same answer from the warm-up?

Differentiate $y = (2x-3)^2$

$x^n = nx^{n-1}$

1.) derivative of outer

2.) deriv of inner

3.) rewrite original inner functi

$2(2x-3)'$

$2 \cdot 2(2x-3)'$

$4(2x-3)$

$8x-12$

Chain rule	$y = g(u),\ u = f(x) \Rightarrow \frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$

Differentiate $f(x) = (4x^2 + x - 3)^2$

find $f'(x)$

$2(8x+1)(4x^2+x-3)$

$(16x+2)(4x^2+x-3)$

1.) derivative of outer

2.) deriv of inner

3.) rewrite original inner functi

find $\frac{d\,f(x)}{dx}$ for $f(x) = (9x^2-2x+1)^4$

$4(18x-2)(9x^2-2x+1)^3$

1.) derivative of outer

2.) deriv of inner

3.) rewrite original inner functi

$$f(x) = 3x^3 - 4x^2 - \frac{3}{x^3}$$

$$f(x) = 3x^3 - 4x^2 - 3x^{-3}$$

$$f'(x) = 9x^2 - 8x + 9x^{-4}$$

$$f'(x) = 9x^2 - 8x + \frac{9}{x^4}$$

$64^{\wedge 1/2}$ $9^{\wedge 1/2}$

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

$x^{1/2} = f(x)$

$\frac{1}{2} \cdot \frac{x^{-1/2}}{1}$ $\frac{1}{2} \cdot \frac{1}{x^{1/2}}$

$2x^{1/4}$

$2\sqrt[4]{x}$

Find f'(x) for $f(x) = \sqrt{(12x^2 - 4x + 7)}$

$(12x^2 - 4x + 7)^{1/2}$

$\frac{1}{2}(24x - 4)(12x^2 - 4x + 7)^{-1/2}$

$\frac{24x - 4}{2(12x^2 - 4x + 7)^{1/2}}$

$\frac{24x - 4}{2\sqrt{12x^2 - 4x + 7}}$

Challenge: Find dy/dx for $y = \sin x$

Find $\frac{d}{dx} f(x)$ for $f(x) = (5 - 2x + 6x^4)^9$

Challenge: Find f'(x) for f(x) = cos x

Differentiate $y = (6x)^{-2/3}$

Challenge: Differentiate $f(x) = \dfrac{4x - 3}{\sqrt{x}}$

Minimum or Maximum: ding ding ding!!!

Challenge: Differentiate $f(x) = \frac{4x - 3}{\sqrt{x}}$