Good afternoon: warm up example (write the question plz)

Find the values of b and c that make the function differentiable everywhere.

$$f(x) = \begin{cases} 3x^2 + 4x & x \le 1 \\ 2x^3 + bx + c & x > 1 \end{cases}$$

$$\rightarrow f' = \begin{cases} 6x + 4 & x \le 1 \\ 6x^2 + b & x > 1 \end{cases}$$

CONT:

$7 = 2 + b + c$

$* \; 5 = b + c$

$c = 1$ ✓

DIFF

$10 = 6 + b$

$4 = b$

$$f(x)=\begin{cases} ax^2+10, & x<2 \\ x^2-6x+b, & x\geq 2 \end{cases}$$

Find a and b to make f(x) differentiable

Cont.

$a\cdot 2^2+10 = 2^2-6\cdot 2+b$

$4a+10=-8+b$

$\star\ 4a-b=-18$

$4\left(-\frac{1}{2}\right)-b=-18$

$-2-b=-18 \Rightarrow 16=b$

$f'=\begin{cases} 2ax & x<2 \\ 2x-6 & x\geq 2 \end{cases}$

Diff:

$2\cdot a\cdot 2 = 2\cdot 2-6$

$4a=-2$

$a=-\frac{1}{2}$

HW

Grab a marker and write your answer to one of the problems you did on the chart paper.

On your whiteboard:

Write a problem down that requires the chain rule to differentiate.

ex:

$y = (5x-3)^4$

$y'=4(5x-3)^3*5$
$y'=20(5x-3)^3$

Write a problem down that requires a trig derivative and the quotient rule to solve.

$$y = \frac{\sin(x)}{x-3}$$

Write a problem down that requires the chain rule and quotient rule to solve.

$$y = \frac{(2x-3)^6}{x+5}$$

Find y' if y= $2x^2 * (x-3)^4 * \sin(3x)$

$$y = f(x) \cdot g(x) \cdot h(x)$$

$$\frac{d}{dx} f \cdot g = f'g + fg'$$ Product rule

$$\frac{d}{dx} f \cdot g \cdot h = f'gh + fg'h + fgh'$$

extension
of the product rule

Your history with functions

Can you take its derivative?

- Constant
- Linear
- Absolute Value
- Quadratic
- Cubic, Quartic, Polynomial
- Rational
- Exponential
- Logarithmic
- Trigonometric
- Inverse Trigonometric

$\frac{x-2}{x+5}$

Exponential and Logarithmic Derivatives (add to booklet)

[redacted]

$$\frac{d}{dx}e^x = e^x$$

$$\frac{d}{dx}\ln(x) = \frac{1}{x}$$

$$\frac{d}{dx}a^x = a^x \ln a$$

$$\frac{d}{dx}\log_a x = \frac{1}{x \ln a}$$

Hw:
- Add inverses to booklet
- #11, 12
- #449, 450
- #466

Find the derivative of $y=e^{\cos(x)}$

Find the derivative of $y = \ln (5x^2-3)$

Inverse Trig Derivative

If $y=\arcsin(x)$, find y'

Inverse Trig Derivatives (the last rules to remember!!)

$$\frac{d}{dx}\arcsin x = \frac{1}{\sqrt{1-x^2}} \qquad \frac{d}{dx}\arccos x = -\frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}\arctan x = \frac{1}{1+x^2} \qquad \frac{d}{dx}\operatorname{arccot} x = -\frac{1}{1+x^2}$$

$$\frac{d}{dx}\operatorname{arcsec} x = \frac{1}{x\sqrt{x^2-1}} \qquad \frac{d}{dx}\operatorname{arccsc} x = -\frac{1}{x\sqrt{x^2-1}}$$

Find the derivative function for $y=\tan^{-1}(3x)$