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

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

$$f(x) = \begin{cases} 3x^2 + 4x & x \leq 1 \\ 2x^3 + bx + c & x > 1 \end{cases} \Rightarrow f'(x) = \begin{cases} 6x+4, & x \leq 1 \\ 6x^2+b, & x > 1 \end{cases}$$

Is f continuous @ $x=1$?

$$\lim_{x \to 1^-} f(x) = f(1) = \lim_{x \to 1^+} f(x)$$

$$3(1)^2 + 4(1) = 3(1)^2 + 4(1) = 2(1)^3 + b(1) + c$$

$$7 = 7 = 2 + b + c$$

$$5 = b + c$$

Is $f'(x)$ cont @ $x=1$?

$$\lim_{x \to 1^-} f'(x) = f'(1) = \lim_{x \to 1^+} f'(x)$$

$$6(1) + 4 = 6(1) + 4 = 6(1)^2 + b$$

$$10 = 10 = 6 + b$$

$$b = 4$$

$$c = 1$$

last class....

Exponential/Logarithmic Derivatives

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

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

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

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

$f(x)=\underbrace{x^2}_{f}\underbrace{e^{2x}}_{g}$

Product Rule: $f'g+fg'$

$f: x^2 \quad g: e^{2x}$

$f': 2x \quad g': e^{2x}\cdot 2$

$2e^{2x}$

$f'g+fg'$

$\boxed{2x\cdot e^{2x}+x^2\cdot 2e^{2x}} \rightarrow \boxed{2xe^{2x}(1+x)}$

factor out $2e^{2x}$

$$y = \frac{x+1}{\ln x} \begin{array}{l} \leftarrow f \\ \leftarrow g \end{array}$$

Quotient Rule:

$$\frac{f'g - fg'}{g^2}$$

$f: x+1 \quad g: \ln x$

$f': 1 \quad g': \frac{1}{x}$

$$\frac{dy}{dx} = \frac{1 \cdot \ln x - (x+1)\left(\frac{1}{x}\right)}{(\ln x)^2}$$

$$\frac{\ln x - \frac{x+1}{x}}{(\ln x)^2} \cdot \frac{x}{x}$$

to get rid of complex fraction

$$\frac{x \cdot \ln x - (x+1)}{x \cdot (\ln x)^2}$$

$$\frac{x \cdot \ln x - x - 1}{x \cdot (\ln x)^2}$$

$f(x) = \log_3(\cos(2x))$

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

$$\frac{1}{\cos(2x)\ \ln 3} \cdot -\sin(2x) \cdot 2$$

$$\frac{-2\sin(2x)}{\ln 3 \cdot \cos 2x}$$

$$-\frac{2}{\ln 3}\tan(2x)$$

HW
handout
choose any 6 from the 3 marked sections