

Math 201 Quiz 8A

October 16, 2019

Name: ANSWERS

Instructions: No calculators. Use your own scrap. Write your fully simplified answers in the space provided.

1. State the equations in the following rules:

(a) Power rule: $\frac{d}{dx} X^n = nX^{n-1}$ (b) Product rule: $\frac{d}{dx}(fg) = f'g + fg'$
 (c) Quotient rule: $\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{f'g - fg'}{g^2}$ (d) Chain rule: $\frac{d}{dx} f(g(x)) = f'(g(x)) \cdot g'(x)$

2. Assuming existence, state the equation that defines the derivative of $f(x)$: $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$

3. Complete the following formulas, assume u is a function of x :

(a) $\frac{d}{dx} a^u = u' a^u \ln a$ (b) $\frac{d}{dx} \ln u = \frac{u'}{u}$ (c) $\frac{d}{dx} e^u = u' e^u$
 (d) $\frac{d}{dx} \sin x = \cos x$ (e) $\frac{d}{dx} \cos x = -\sin x$ (f) $\frac{d}{dx} \log_a x = \frac{1}{x \ln a}$

4. Differentiate:

(a) $\frac{d}{dx} x e^x = e^x + x e^x$ (b) $\frac{d}{dx} \frac{x}{\ln x} = \frac{\ln x - 1}{(\ln x)^2}$ Note: $\ln x^2 \neq (\ln x)^2$
 (c) $\frac{d}{dx} \cos(x^5 + e^x) = -(5x^4 + e^x) \sin(x^5 + e^x)$
 (d) $\frac{d}{dx} (e^{\ln \sqrt{5}} + \sin^2 x + \cos^2 x) = 0$

Bonus:

1. Differentiate: $\frac{d}{dx} \tan x = \sec^2 x$

2. Differentiate: $\frac{d}{dx} \sin^2 x = 2 \sin x \cos x$ OR $\sin 2x$

3. Differentiate: $\frac{d}{dx} \ln \sqrt{\frac{e^x x^3}{(x+1)^3}} = \frac{1}{2} \left(1 + \frac{3}{x} - \frac{3}{x+1} \right)$

4. If $x^2 y^3 - 3x + 2y = \ln x + 1$, find $\frac{dy}{dx} = \frac{1 + 3x - 2x^2 y^3}{3x^3 y^2 + 2x}$