

Math 201 Quiz 8B

October 16, 2019

Name: ANSWERS

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

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

2. 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: $\frac{d}{dx}f(g(x)) = f'(g(x)) \cdot g'(x)$

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

4. Differentiate:

(a) $\frac{d}{dx} x \sin x =$ $\sin x + x \cos x$ (b) $\frac{d}{dx} \frac{\ln x}{x} =$ $\frac{1 - \ln x}{x^2}$

(c) $\frac{d}{dx} \sqrt{x^7 + e^x} =$ $\frac{7x^6 + e^x}{2\sqrt{x^7 + e^x}}$

(d) $\frac{d}{dx} (e^{\ln x} + \sin^2 x + \cos^2 x) =$ 1

Bonus:

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

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

3. Differentiate: $\frac{d}{dx} \ln \sqrt{\frac{e^x x^5}{(x+4)^3}} =$ $\frac{1}{2} \left(1 + \frac{5}{x} - \frac{3}{x+4}\right)$

4. If $x^3 y^2 - 3x^2 + 2y = \ln x + 4$, find $\frac{dy}{dx} =$ $\frac{1 + 6x^2 - 3x^3 y^2}{2x^4 y + 2x}$