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Quiz 2A, Calculus I - No Calculators $\frac{8:44}{3}$

Dr. Graham-Squire, Spring 2014

Name: Key

1. (4 points) Use the shortcut rules, not the limit definition, to calculate $f'(x)$ if

$$h(x) = (e^x \cdot x^2)(x^3 + 3).$$

$\qquad\qquad\qquad\uparrow f(x) \qquad \uparrow g(x)$

You do not need to simplify your answer.

$f(x) = e^x \cdot x^2$

$f'(x) = e^x \cdot x^2 + 2x e^x$

Product Rule!

$$h'(x) = f'(x)g(x) + g'(x)f(x)$$

$$= \boxed{(e^x \cdot x^2 + 2xe^x)(x^3+3) + (3x^2)(e^x \cdot x^2)}$$

or $h(x) = e^x \cdot x^5 + 3e^x x^2$

$$h'(x) = \boxed{e^x \cdot x^5 + 5x^4 e^x + 3(e^x \cdot x^2 + 2xe^x)}$$

$$= \boxed{e^x x^5 + 5x^4 e^x + 3x^2 e^x + 6xe^x}$$

All of these all fine answers.

or $h(x) = (e^x)(x^2)(x^3+3)$

$$h'(x) = \boxed{e^x \cdot x^2 (x^3+3) + e^x(2x)(x^3+3) + e^x(x^2)(3x^2)}$$

-0.5 for each derivative (Power Rule) mistake

-1 for each product rule forgotten.

2. (4 points) Use the quotient rule to prove the derivative rule that $\frac{d}{dx} \csc x = -\csc x \cot x$.

$$\frac{d}{dx}(\csc x) = \frac{d}{dx} \frac{1}{\sin x} = \frac{0 \cdot \sin x - 1 \cdot \cos x}{\sin^2 x}$$

$$= \frac{-\cos x}{\sin^2 x}$$

$$= -\frac{1}{\sin} \cdot \frac{\cos x}{\sin x}$$

$$= -\csc x \cot x$$

3. (2 points) Let $f(x) = 7$. Use the limit definition of the derivative to prove that $f'(x) = 0$.

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$= \lim_{h \to 0} \frac{7 - 7}{h}$$

$$= \lim_{h \to 0} \frac{0}{h}$$

$$= \lim_{h \to 0} 0 = \boxed{0}$$