Quiz4 on Math1271 at 02.28.13

Name(Print): SOLUTIONS  TA: __________________________
Section: __________________________  Time limit: 20 minutes, Grader: Guowei Yu

"NO CALCULATORS. NO HANDHELD DEVICES. NO BOOKS OR REFERENCE MATERIALS
OF ANY KIND."

1. (15 points) Let $f$ and $g$ be two differentiable functions, which of the following is NOT correct?

   (a) $\frac{d}{dx}[f(x) + g(x)] = f'(x) + g'(x);

   (b) $\frac{d}{dx}[(f(x))(g(x))] = (f'(x))(g(x)) + (f(x))(g'(x));

   (c) $\frac{d}{dx}[f(g(x))] = f'(g(x)) + f(g'(x));

   (d) $\frac{d}{dx} \left[ \frac{f(x)}{g(x)} \right] = \frac{(f'(x))(g(x)) - (f(x))(g'(x))}{g^2(x)}$, assuming $g(x) \neq 0$.

2. (35 points) Compute $\frac{d}{dx}[\cos^2(e^{\cos x})]$.

\[
\frac{d}{dx}[\cos^2(e^{\cos x})] = 2 \cos(e^{\cos x}) \left[ -\sin(e^{\cos x}) \right] [e^{\cos x}] [-\csc^2 x]
\]

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3. (15 points) Among the following formulas, which one is NOT correct?

(a) \( \frac{d}{dx} \csc(x) = -\csc(x) \cot(x) \);

(b) \( \frac{d}{dx} \sec(x) = \sec(x) \tan(x) \);

(c) \( \frac{d}{dx} \tan(x) = \sec^2(x) \);

(d) \( \frac{d}{dx} \cot(x) = \csc^2(x) \).

4. (35 points) Find an equation of the tangent line to the graph of \( y = \ln(e^{-3x} + xe^{-3x}) \) at the point \((0, 0)\).

\[
f(x) = \ln(e^{-3x}(1+x)) = \ln(e^{-3x}) + \ln(1+x) = -3x + \ln(1+x)
\]

\[
f'(x) = -3 + \frac{1}{1+x}
\]

Slope = \( f'(0) = -3 + \frac{1}{1} = -2 \)

Eqn: \( y - 0 = -2(x-0) \)

\( y = -2x \)

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