University of Michigan
Student Name:

Math 115 Quiz 4

Section 9 - Winter 2011
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Chain rule: $[f(g(x))]' = f'(g(x)) \cdot g'(x)$

Product rule: $[f(x) \cdot g(x)]' = f'(x) \cdot g(x) + f(x) \cdot g'(x)$

Quotient rule: $[\frac{f(x)}{g(x)}]' = \frac{f'(x) \cdot g(x) - f(x) \cdot g'(x)}{g(x)^2}$

Some basic short-cuts: $[\sin(x)]' = \cos(x)$ $[\cos(x)]' = -\sin(x)$ $[\ln(x)]' = \frac{1}{x}$ $[x^n]' = nx^{n-1}$

$[a^x]' = \ln(a)a^x$, where a is a positive constant.

Using the basic properties and the short-cuts for differentiation, find the derivatives of the following functions. You do not need to simplify your answers.

(1) $f(x) = \cos(x^4 4^x + e^{-x})$

Solution

$$f'(x) = -\sin(x^4 4^x + e^{-x}) \cdot (4x^3 \cdot 4^x + x^4 \cdot \ln(4)4^x - e^{-x})$$

(2) $g(x) = \frac{\ln(\sin(3x))}{x^2 + 2^x}$

Solution

$$g'(x) = \frac{\frac{1}{\sin(3x)} \cdot \cos(3x) \cdot 3 \cdot (x^2 + 2^x) - \ln(\sin(3x)) \cdot (2x + \ln(2) \cdot 2^x)}{(x^2 + 2^x)^2}$$