Math 1151, Quiz #15, Fall 2014 Name KEY

Instructions: Show all work. Answers without work may only receive partial credit. If you are asked for an explanation, explain as completely as possible. Use exact answers unless specifically asked to round.

1. Find the derivatives of the following functions.

a. $f(x) = \ln^{-5} 2x$

$-5\ln^{-6} 2x \cdot \frac{1}{2x} \cdot 2 \Rightarrow \frac{-5\ln^{-6}(2x)}{x}$

b. $g(x) = x^e + e^x$

$ex^{e-1} + e^x$

c. $h(x) = x^{\tan x}$ $\Rightarrow$ $y = x^{\tan x}$ $\ln y = \tan x \cdot \ln x$

$\frac{1}{y} y' = \sec^2 x \cdot \ln x + \tan x \cdot \frac{1}{x}$

$h'(x) = \left[\sec^2 x \cdot \ln x + \frac{\tan x}{x}\right] x^{\tan x}$

d. $p(x) = \cosh x \sinh x$

$\sinh x \cdot \sinh x + \cosh x \cdot \cosh x =$

$\sinh^2 x + \cosh^2 x$

e. $q(x) = x^2 \tanh^3 4x$

$2x \tanh^3 4x + x^2 \cdot 3\tanh^2 4x \cdot \operatorname{sech}^2 4x \cdot 4$

$2x \tanh^3 4x + 12x^2 \tanh^2 4x \operatorname{sech}^2 4x$

2. Find the following integrals.

a. $\int 4^{\sin x} \cos x \, dx$

$u = \sin x$

$du = \cos x \, dx$

$$\int 4^u \, du = \frac{4^u}{\ln 4} + C = \frac{4^{\sin x}}{\ln 4} + C$$

b. $\int \frac{3^{\ln x}}{x} dx$

$u = \ln x$

$du = \frac{1}{x} dx$

$$\int 3^u \, du = \frac{3^u}{\ln 3} + C = \frac{3^{\ln x}}{\ln 3} + C$$

c. $\int \operatorname{sech}^2 x \tanh x \, dx$

$u = \tanh x$

$du = \operatorname{sech}^2 x \, dx$

$$\int u \, du = \frac{1}{2} u^2 + C = \frac{1}{2} \tanh^2 x + C$$

d. $\int \frac{\sinh x}{1+\cosh x} dx$

$u = 1 + \cosh x$

$du = \sinh x \, dx$

$$\int \frac{1}{u} \, du = \ln|u| + C = \ln|1 + \cosh x| + C$$