KEY

Math 125-Quiz 19[1]
October 28, 2011

You have ten minutes to complete this quiz.
Find $f'(x)$ for each given function.

1. $f(x) = x^2 \ln x$

$$f'(x) = x^2 \cdot \left(\frac{1}{x}\right) + 2x \ln x = x + 2x \ln x$$

2. $f(x) = \ln(\ln x)$

$$f'(x) = \frac{1}{\ln x} \cdot \frac{1}{x} = \frac{1}{x \ln x}$$

3. $f(x) = \sin(\ln(x))$

$$f'(x) = \cos(\ln(x)) \cdot \frac{1}{x}$$

4. $f(x) = \ln \sqrt{\dfrac{x^2-1}{x^2+1}}$ (Hint: Clean this one up first by using log rules.)

$$f(x) = \frac{1}{2} \ln \frac{x^2-1}{x^2+1} = \frac{1}{2}\left(\ln(x^2-1) - \ln(x^2+1)\right)$$

$$f'(x) = \frac{1}{2}\left(\frac{1}{x^2-1}\cdot 2x - \frac{1}{x^2+1}\cdot 2x\right)$$

$y = (2x)^{x^2}$

5. $f(x) = (2x)^{x^2}$ (Use logarithmic differentiation here).

$$\ln y = \ln(2x)^{x^2}$$

$$\ln y = x^2 \ln 2x$$

$$\frac{1}{y}\frac{dy}{dx} = 2x \ln 2x + x^2 \cdot \frac{1}{2x} \cdot 2$$

$$\frac{1}{y}\frac{dy}{dx} = (2x \ln 2x + x)$$

$$\frac{dy}{dx} = y(2x \ln 2x + x)$$

$$= (2x)^{x^2}(2x \ln 2x + x)$$