MATH 2250 Calculus I
Eric Perkerson

Name: Answers
Date: September 17, 2015

Quiz No. 3

Show all of your work, label your answers clearly, and do not use a calculator.

Problem 1 State the following rules for derivatives:

a *The constant rule*

b *The constant multiple rule*

c *The sum rule*

d *The product rule*

e *The power rule*

f *The quotient rule*

Look them up

Problem 2 Prove the constant multiple rule.

The constant multiple rule states that, if $g(x) = cf(x)$, then $g'(x) = cf'(x)$

By definition of the derivative:

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

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

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

$$= cf'(x)$$

Problem 3 Find the derivative of the following function, remembering to show all of your work:

$$f(x) = \left(\frac{1}{x} + 4x^5\right)\left(x^5 + \sqrt{x}\right)$$

$$f'(x) = \frac{\partial}{\partial x}\left(\left(\frac{1}{x} + 4x^5\right)\left(x^5 + \sqrt{x}\right)\right)$$

$$= \left(\frac{\partial}{\partial x}\left(\frac{1}{x} + 4x^5\right)\right)\left(x^5 + \sqrt{x}\right) + \left(\frac{1}{x} + 4x^5\right)\left(\frac{\partial}{\partial x}\left(x^5 + \sqrt{x}\right)\right)$$

$$= \left(\frac{-1}{x^2} + 20x^4\right)\left(x^5 + \sqrt{x}\right) + \left(\frac{1}{x} + 4x^5\right)\left(5x^4 + \frac{1}{2}x^{-1/2}\right)$$

Problem 4 Find the derivative of the following function, remembering to show all of your work:

$$f(x) = \frac{3x^2 + 80x}{e^x + 2x}$$

$$f'(x) = \frac{d}{dx}\left(\frac{3x^2 + 80x}{e^x + 2x}\right)$$

$$= \frac{(e^x + 2x)\frac{d}{dx}(3x^2 + 80x) - (3x^2 + 80x)\frac{d}{dx}(e^x + 2x)}{(e^x + 2x)^2}$$

$$= \frac{(e^x + 2x)(6x + 80) - (3x^2 + 80x)(e^x + 2)}{(e^x + 2x)^2}$$