**Calculus I** Name:_____

**TA/classroom:**_____ Student ID:_____

# Quiz 5

Nov. 7, 2007

1. (10 pts) Find the derivative of

$$f(x) = \frac{x^5 + 2x^3 + 4x + 1}{x^2}$$

Ans:

$$\begin{aligned} f'(x) =& \frac{(5x^4 + 6x^2 + 4)x^2 - (x^5 + 2x^3 + 4x + 1)(2x)}{(x^2)^2} \\ =& \frac{5x^6 + 6x^4 + 4x^2 - 2x^6 - 4x^4 - 8x^2 - 2x}{(x^2)^2} \\ =& \frac{3x^6 + 2x^4 - 4x^2 - 2x}{(x^2)^2} \\ =& 3x^2 + 2 - 4x^{-2} - 2x^{-3} \end{aligned}$$

or

$$f(x) = \frac{x^5 + 2x^3 + 4x + 1}{x^2} = x^3 + 2x + 4x^{-1} + x^{-2} \Rightarrow f'(x) = 3x^2 + 2 - 4x^{-2} - 2x^{-3}$$

2. (5 pts) Find the derivative of

$$f(x) = \sqrt{x^2 + x} = (x^2 + x)^{1/2}$$

Ans:

$$\begin{aligned} f'(x) =& \frac{1}{2}(x^2 + x)^{-1/2}(x^2 + x)' \\ =& \frac{1}{2}(x^2 + x)^{-1/2}(2x + 1) \end{aligned}$$

3. (5 pts) Find the derivative of

$$f(x) = x^2\sqrt{x^2 + x}$$

Ans:

$$\begin{aligned} f'(x) =& (x^2)'\sqrt{x^2 + x} + x^2(\sqrt{x^2 + x})' \\ =& 2x(x^2 + x)^{1/2} + x^2\frac{1}{2}(x^2 + x)^{-1/2}(2x + 1) \end{aligned}$$