

$$12x^{19/2} + 40x^{15/2} + 12x^{13/2} + 36^{11/2} + 3x^5 + 20x^{9/2} +$$

$$4x^3 - 6x^2 + 9x + 2$$

MAT 106

Quiz #3

9 September 2004

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

Name: Key

You may not use your notes. Please show all of your work. An answer without justification will receive little credit.

- (1) Use the quotient and product rules to differentiate the following function.

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

Quotient Rule (2)

$$f'(x) = \frac{\frac{d}{dx}[(x^3 + 3x + 2)(x^5 + \sqrt{x})](x^2 + 1) - \frac{d}{dx}(x^2 + 1)(x^3 + 3x + 2)(x^5 + \sqrt{x})}{(x^2 + 1)^2}$$

Product Rule (2)

$$= \frac{\left[\frac{d}{dx}(x^3 + 3x + 2)(x^5 + \sqrt{x}) + \frac{d}{dx}(x^5 + \sqrt{x})(x^3 + 3x + 2) \right] - \frac{d}{dx}(x^2 + 1)(x^3 + 3x + 2)(x^5 + \sqrt{x})}{(x^2 + 1)^2}$$

Correct eval. of derivative 1pt.

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

- (2) Find the equation of the tangent line to the graph of $y = x^{1/3}$ at the point (8, 2).

$$y = x^{1/3} \Rightarrow \frac{dy}{dx} = \frac{1}{3} x^{-2/3} \rightarrow 1 \text{ pt.}$$

so the slope of the tangent line is

$$\left. \frac{dy}{dx} \right|_{x=8} = \frac{1}{3} (8)^{-2/3} = \frac{1}{3} \frac{1}{(8^{1/3})^2} = \frac{1}{12} \quad (2 \text{ pt.})$$

so the equation of the tangent line to $y = x^{1/3}$ at (8, 2) is

$$y - 2 = \frac{1}{12} (x - 8)$$

$$-2/3$$

$$4/3$$

2pt.