

Quiz 3, Business Calculus

Summer Session 1, 2012

8:27

8:30

3

Name: _____

Key

1. (4 points) Use the limit definition of the derivative to find $f'(x)$ if $f(x) = x^2 - 2$. You can use the power rule to check your work, but you will not receive full credit unless you show your work using the limit definition.

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$= \lim_{h \rightarrow 0} \frac{2xh + h^2}{h}$$

$$= \lim_{h \rightarrow 0} 2x + h$$

$$= 2x + 0$$

$$= \boxed{2x}$$

$$f(x+h) = (x+h)^2 - 2$$
$$= x^2 + 2xh + h^2 - 2$$

$$f(x+h) - f(x) =$$

$$x^2 + 2xh + h^2 - 2 - (x^2 - 2)$$

$$= 2xh + h^2$$

-1 for no limit or other poor notation

2. (3 points) Find $f'(x)$ if $f(x) = \frac{x^3 + 7}{x^2 + 1}$. Simplify your answer by combining like terms in the numerator (if they exist).

$$f'(x) = \frac{(x^2 + 1)(3x^2) - (x^3 + 7)(2x)}{(x^2 + 1)^2}$$

$$= \frac{3x^4 + 3x^2 - 2x^4 - 14x}{(x^2 + 1)^2}$$

$$= \boxed{\frac{x^4 + 3x^2 - 14x}{(x^2 + 1)^2}}$$

3. (3 points) Find $f'(x)$ if $f(x) = (x^7 + 2x^2 + 3)^{10}$. You do not need to simplify your answer.

$$f'(x) = \boxed{10(x^7 + 2x^2 + 3)^9(7x^6 + 4x)}$$