Quiz 2A, Calculus I

Dr. Graham-Squire, Spring 2013

Name: Key

1. (3 points) Use the limit definition of the derivative

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

to prove that the derivative of a constant function is zero. That is, for $f(x) = c$, prove that $f'(x) = 0$.

$f(x+h) = c \qquad f(x) = c$

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

$$= \lim_{h \to 0} \frac{0}{h}$$

$$= \lim_{h \to 0} 0$$

$$= \boxed{0}$$

$f(x)$

2. (4 points) Use the shortcut rules (<u>not</u> the definition) to calculate $h'(x)$ if $h(x) = (x^3+7)(\sin x)$. You do not need to simplify your answer.

$g(x)$

Product Rule: $h'(x) = f'(x)g(x) + g'(x)f(x)$

$$= \boxed{3x^2 \cdot \sin x + \cos x\,(x^3+7)}$$

or $3x^2 \sin x + x^3 \cos x + 7 \cos x$

2 for product rule ✓

2 for $\cos x$. ✓

3. (3 points) Use the shortcut rules (<u>not</u> the definition) to calculate $f'(x)$ if $f(x) = \dfrac{x^8 - 5x^2}{x^6}$. If necessary, simplify your answer so that there are no fractions.

$f(x) = \dfrac{x^8}{x^6} - \dfrac{5x^2}{x^6}$

$f(x) = x^2 - 5x^{-4}$

$\Rightarrow \boxed{f'(x) = 2x + 20x^{-5}}$

Quiz 2B, Calculus I

Dr. Graham-Squire, Spring 2013

Name: Key

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1. (3 points) Use the shortcut rules (<u>not</u> the definition) to calculate $f'(x)$ if

$$f(x) = \frac{x^9 - 4x^3}{x^5}.$$

If necessary, simplify your answer so that there are no fractions.

$$f(x) = \frac{x^9}{x^5} - \frac{4x^3}{x^5}$$

$$f(x) = x^4 - 4x^{-2}$$

$$\Rightarrow \boxed{f'(x) = 4x^3 + 8x^{-3}}$$

2. (3 points) Use the limit definition of the derivative

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

to prove that the derivative of a constant function is zero. That is, for $f(x) = c$, prove that $f'(x) = 0$.

$f(x+h) = c$

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

$$= \lim_{h\to 0} \frac{0}{h}$$

$$= \lim_{h\to 0} 0$$

$$= \boxed{0}$$

$f(x) \quad g(x)$

3. (4 points) Use the shortcut rules (<u>not</u> the definition) to calculate $h'(x)$ if $h(x) = (x^5+3)(\cos x)$. You do not need to simplify your answer.

Product Rule

$$h'(x) = f'(x)g(x) + f(x)g'(x)$$

$$\boxed{= 5x^4 \cos x + (x^5+3)(-\sin x)}$$

$$= 5x^4 \cos x - \sin x(x^5+3)$$

$f'(x) = 5x^4$

$g'(x) = -\sin x$