MATH 108 – QUIZ 4 – 16 FEBRUARY 2011

Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. (2 pts. each) Find the derivative of each of the following functions. Reasonable simplification is expected.

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

$f'(x) = 15x^4 + 3x^{-2} + 5/2\,x^{3/2}$ //

(b) $y = x^2(x^3 - 6x)$

Multiply out:

$y = x^5 - 6x^3$

$y' = 5x^4 - 18x^2$ //

or Product Rule:

$y' = x^2 \frac{d}{dx}(x^3 - 6x) + (x^3 - 6x)\frac{d}{dx}(x^2)$

$= x^2(3x^2 - 6) + (x^3 - 6x)(2x)$

$= 3x^4 - 6x^2 + 2x^4 - 12x^2$

$= 5x^4 - 18x^2$ //

2. (3 pts. each) Use the product rule, quotient rule, or chain rule to compute the derivative of each of the following functions. Reasonable simplification is expected.

(a) $f(x) = \frac{x}{2x+3}$. Quotient rule:

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

$= \frac{3}{(2x+3)^2}$ //

(b) $y = (\sqrt{t}+1)^5$. Chain rule:

$\frac{dy}{dx} = 5(t^{1/2}+1)^4 \frac{d}{dt}(t^{1/2}+1)$

$= 5(t^{1/2}+1)^4(\frac{1}{2}t^{-1/2}) = \frac{5}{2}t^{-1/2}(t^{1/2}+1)^4$ //

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1. (2 pts. each) Find the derivative of each of the following functions. Reasonable simplification is expected.

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

$f'(x) = 15x^2 - \frac{1}{2}x^{-1/2} - 10x^{-3}$ //

(b) $y = x^3(x^2 - 3x)$

Multiply out:

$y = x^5 - 3x^4$

$y' = 5x^4 - 12x^3$ //

or Product Rule

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

$= x^3(2x - 3) + (x^2 - 3x)(3x^2)$

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

$= 5x^4 - 12x^3$ //

2. (3 pts. each) Use the product rule, quotient rule, or chain rule to compute the derivative of each of the following functions. Reasonable simplification is expected.

(a) $f(x) = (x^2 - 3x + 2)(2x^2 + 5x - 1)$. Product rule:

$f'(x) = (x^2 - 3x + 2)(4x + 5) + (2x^2 + 5x - 1)(2x - 3)$

$= 4x^3 - 7x^2 - 7x + 10 + 4x^3 + 4x^2 - 17x + 3$

$= 8x^3 - 3x^2 - 24x + 13$ //

(b) $y = 6(5t^3 + 1)^{1/2}$.

$y' = 6 \cdot \frac{1}{2}(5t^3 + 1)^{-1/2}(15t^2)$

$= 45t^2(5t^3 + 1)^{-1/2}$ //