Math 1100-5
Fall 2004

Name: ______________________________

Derivative Practice

Instructions Compute the following derivatives or derivative applications using the techniques and rules developed in class. Recall the rule of thumb: simplify only when needed or for clarity.

1. $f(x) = x^{3/2} + 5x^2 + 3$

$f' = \frac{3}{2} x^{1/2} + 10x$

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

$f' = \dfrac{\frac{1}{2}(x^2+1)^{-1/2} \cdot (2x)(x+1) - \left(\sqrt{x^2+1}\right)(1)}{(x+1)^2}$

3. $g(t) = \frac{t+1}{t^4+\sqrt{t}}$

$g' = \dfrac{(t^4+\sqrt{t}) - (t+1)\left(4t^3 + \frac{1}{2}t^{-1/2}\right)}{(t^4+\sqrt{t})^2}$

4. $r(x) = \left(x^2+1\right)^4 \left(\sqrt{x+1}\right)$

$r' = 4(x^2+1)^3 \cdot 2x \left(\sqrt{x+1}\right) + (x^2+1)^4 \cdot \frac{1}{2}(x+1)^{-1/2}$

5. $f(x) = x(x^2+4)^{1/3}$

$f' = (x^2+4)^{1/3} + x \cdot \left(\frac{1}{3}(x^2+4)^{-2/3} \cdot 2x\right)$

6. $f(x) = \frac{\sqrt{x+1}}{(x+4)^2}$

$f' = \dfrac{\frac{1}{2}(x+1)^{-1/2} \cdot (x+4)^2 - 2(x+4)\left(\sqrt{x+1}\right)}{(x+4)^4}$

7. $g(x) = [(x+1)(x^2+5)]^4$

$g' = 4[(x+1)(x^2+5)]^3 \cdot$

$((x^2+5) + 2x(x+1))$

10. $s(t) = (t^3 + 4\sqrt{t})^{5/2}$

$s' = \frac{5}{2}(t^3+4\sqrt{t})^{3/2} \cdot (3t^2 + \frac{4}{2}t^{-1/2})$

8. $y(x) = \frac{x+1}{\sqrt{x}(x^2+1)}$

$$y' = \frac{\sqrt{x}(x^2+1) - (x+1)\left(\frac{1}{2}x^{-1/2} \cdot (x^2+1) + 2x\sqrt{x}\right)}{(\sqrt{x}(x^2+1))^2}$$

11. $w(p) = (p^2+1)^{-5}$

$w' = -5(p^2+1)^{-6} \cdot 2p$

9. $y(x) = \frac{2x-1}{9x^3+x^{5/2}}$

$y' = \left[2(9x^3 + x^{5/2}) - (2x-1)(27x^2 + \frac{5}{2}x^{3/2})\right] / (9x^3 + x^{5/2})^2$

12. Suppose the revenue function for a product is given by:

$$R(x) = 15(2x+1)^{-1} + 30x - 15,$$

where x is in the thousands of units, and R is the thousands of dollars made.

a. Find the marginal revenue when 2000 units are sold.
b. How is the revenue changing when 2000 units are sold?