Math 124 Section 16 **QUIZ 11** **Nov 28, 2007**

Show your work in all problems.

1. Find the derivatives of the following functions:

product rule: $(f\cdot g)' = f'\cdot g + f\cdot g'$

(a) $k(x) = \underbrace{x^5}_{f} \cdot \underbrace{3^x}_{=g}$

$$k'(x) = \underbrace{5x^4}_{f'} \cdot \underbrace{3^x}_{g} + \underbrace{x^5}_{f} \cdot \underbrace{3^x \cdot \ln(3)}_{g'}$$

(b) $s(t) = \dfrac{\overbrace{4 - t^2}^{=f}}{\underbrace{5t + 1}_{=g}}$

quotient rule: $\left(\dfrac{f}{g}\right)' = \dfrac{f'\cdot g - f\cdot g'}{(g)^2}$

$$S'(t) = \frac{-2t\cdot(5t+1) - (4-t^2)\cdot 5}{(5t+1)^2}$$

Similar to #35, 38 in 3.4

2. A company producing snowshoes wants to sell them at unit price p dollars. The quantity sold q depends on p, so we write $q = f(p)$. If we know $f(150) = 5000$ and $f'(150) = -25$, answer the following:

(a) Find the revenue when $p = 150$. (Revenue = selling price $\times$ quantity)

$$R(p) = p \cdot q = p \cdot f(p)$$

$$R(200) = 150 \cdot f(150) = 150 \cdot 5000 = \$750000$$

(b) Find $\dfrac{dR}{dp}$ at $p = 150$.

= r.o.c. in revenue as p changes

units of R': $\dfrac{\text{units of } R}{\text{units of } p} = \$/\$$

derivative of p is 1: $\dfrac{d}{dp}(p) = 1 \cdot p^0 = 1$

(just like $y = x$ has derivative $y' = 1$)

$$R(p) = p \cdot f(p)$$

$$R'(p) = 1 \cdot f(p) + p \cdot f'(p)$$

$$R'(150) = 1 \cdot 5000 + 150 \cdot (-25)$$

$$= 5000 - 3750 = 1250 \ \$/\$$$

(c) Should they increase the selling price or decrease it to make more profit? Explain why using your answer to part (b).

Since $R'(150) > 0$, it means R increases when p is near 150. Hence the company should increase selling price to make more profit.