Math 220 – Business Calculus
Spring 2013 Quiz 5
Maxima and Minima

Answer Key

1. Find the absolute max and min (if they exist) and any local max or min for this function on the given interval.

$f(x) = x^3 - 3x^2 - 24x$ on [-3,1)

Find critical points: $f'(x) = 3x^2 - 6x - 24 = 3(x^2-2x-8)$

$= 3(x-4)(x+2) = 0$ at $x = -2$ & $4$

4 not in the interval

| $x$ | $f(x)$ |
|---|---|
| $-3$ | $(-3)^3 - 3(-3)^2 - 24(-3) = 18$ |
| $-2$ | $(-2)^3 - 3(-2)^2 - 24(-2) = 28$ Loc + abs max |
| $1$ | $(1)^3 - 3(1)^2 - 24(1) = -26)$ |

NO abs min

$f''(x) = 6x - 6$

$f''(-2) = 6(-2) - 6 < 0$

2. The demand for a particular product is a function of the price expressed as $q = 300 - 0.01p^2$.

a) Write an equation for revenue as a function of price

$R(p) = (300 - .01p^2)p = 300p - .01p^3$

b) Use this equation to find the price that gives maximum revenue. (Confirm that this price is a maximum)

$R'(p) = 300 - .03p^2 = 0$ $\quad p^2 = \dfrac{300}{.03} = 10{,}000$

$p = 100$

$R''(p) = -.06p$

$R''(100) = -6 < 0$ $\quad \therefore\ p = 100$ is max

c) Write the equation for the elasticity of this situation as a function of price

$E(p) = -\dfrac{p}{300 - .01p^2} \cdot (-.02p) = \dfrac{.02p^2}{300 - .01p^2}$

d) Use elasticity to find the price that maximizes revenue (Note: your answer to parts b and d should be the same. If they aren't, check your work!)

Max Revenue at $\dfrac{.02p^2}{300 - .01p^2} = 1$

$.03p^2 = 300$

$p^2 = 10{,}000$ $\quad p = 100$