Group Quiz 6
Dusty Wilson
Math 148 – Fall 2011

Name: Haoxiang Li
JoChristine Bartolome
Ivan C. Ongkowibowo

No work = no credit

No calculators (or at least not too much)

1.) Suppose a product has daily marginal revenue of $\overline{MR} = 46$ and a daily marginal cost $\overline{MC} = 30 + \frac{1}{5}x$, both in dollars per unit. If the daily fixed cost is \$200, how many units will give maximum profit? What is the maximum profit? Should this business remain open in the short run? Should it remain open in the long run? Please explain.

$R(x) = \int \overline{MR}\, dx = \int 46\, dx = 46x + C$

$R(0) = 46 \times 0 + C = 0 \Rightarrow C = 0 \Rightarrow R(x) = 46x$

$C(x) = \int \overline{MC}\, dx = \int (30 + \frac{1}{5}x)\, dx = 30x + \frac{1}{10}x^2 + C$

$C(0) = 30 \times 0 + \frac{1}{10} \times 0^2 + C = 200 \Rightarrow C = 200 \Rightarrow C(x) = 30x + \frac{1}{10}x^2 + 200$

$P(x) = R(x) - C(x) = 46x - 30x - \frac{1}{10}x^2 - 200$

$P(x) = -\frac{1}{10}x^2 + 16x - 200$

$P'(x) = -\frac{1}{5}x + 16 \Rightarrow x = 80$

$P''(x) = -\frac{1}{5} < 0$

Maximum.

$P(80) = -\frac{1}{10} \times 80^2 + 16 \times 80 - 200 = 440$

If you produce 80 unit daily, it will give you a maximun profit of \$440. The company should remain open in the long run. Because what we get is the daily profit. Everyday they will earn \$440, so they should keep doing it.

20

98/100

2.) Evaluate $I = \int \left(7x^3\sqrt{1-x^4} + \frac{3x}{x^2-1} \right) dx$

let $u = 1 - x^4$

$du = -4x^3\,dx$

let $u = x^2 - 1$

$du = 2x\,dx$

$= \frac{7}{-4}\int (1-x^4)^{\frac{1}{2}}(-4)x^3\,dx + \frac{3}{2}\int \frac{2x}{x^2-1}\,dx$

$= -\frac{7}{4}\int u^{\frac{1}{2}}\,du + \frac{3}{2}\int \frac{du}{u}$

18 $= -\frac{14}{12}u^{\frac{3}{2}} + \frac{3}{2}\ln|u| + C$

$= -\frac{14}{12}(1-x^4)^{\frac{3}{2}} + \frac{3}{2}\ln|(x^2-1)| + C$

3.) Suppose that the marginal propensity to save is $\frac{dS}{dy} = 0.5 - 0.1e^{-2y}$ (in billions of dollars) and consumption is \$7.8 billion when disposable income is 0. Find the national consumption function.

let $u = -2y$

$du = -2dy$

$\frac{dc}{dy} = 1 - \frac{ds}{dy}$

$\frac{dc}{dy} = 1 - (0.5 - 0.1e^{-2y})$

$= 0.5 + 0.1e^{-2y}$

$c(y) = \int 0.5dy + \int 0.1e^{-2y}\,dy$

$= 0.5y + \frac{0.1}{-2}\int e^{-2y}(-2)\,dy$

17 $= 0.5y - 0.05\int e^{u}\,du$

$= 0.5y - 0.05e^{-2y} + C$

$7.8 = 0.5(0) - 0.05e^{-2(0)} + C$

$C = 7.85$

35 $c(y) = 0.5y - 0.05e^{-2y} + 7.85$