Practice Test 2 Solutions
BUSA130

This exam is graded out of 15 points. You must do Problem 1, and you may choose 6 other problems from Problems 2, 3, 4, 5, 6, 7, 8. Do not do all eight problems! Show all work necessary to solve the problems unless otherwise instructed. You have 65 minutes.

1) $R(x) = p(x) \cdot x = \dfrac{1500000x}{0.05x+1} - x$, and so

$$R'(x) = \frac{(0.05x+1)(1500000) - (1500000x)(0.05)}{(0.05x+1)^2} - 1 = \frac{1500000}{(0.05x+1)^2} - 1.$$

So, $R'(24000) = 0.0399$. This means that revenue will increase if we produce another unit, but that does not necessarily mean that we should increase production. We do not know if costs will increase more than revenue! We need the marginal **profit** function to say something about whether or not we should produce an additional unit.

2) It means that the inflation rate would be positive because $\dfrac{I'(x)}{I(x)}$ would be positive. The second derivative being positive would not necessarily mean that the inflation rate was increasing, but it would mean that the CPI was increasing at an increasing rate.

3) Taking the derivative, we get

$$y + xy' + 4xy + 2x^2y' = y' \implies xy' + 2x^2y' - y' = -y - 4xy \implies y'(x + 2x^2 - 1) = -y - 4xy$$

$$\implies y' = \frac{-y - 4xy}{x + 2x^2 - 1}.$$

4) We have

$$\Delta p \approx dp = s'(x)dx = \left(0.2\left(\frac{1}{2}\right)(62500)^{-\frac{1}{2}}\right)(5000) = 2.$$

So the price should increase by about \$2.

5) Let $f(x) = x^2$, $a = 2$. Then $\lim_{h \to 0} \frac{(2+h)^2 - 4}{h} = f'(2) = 4$.

6) For the first function, we get

$$f'(x) = 4\left(\frac{x+2}{1-2x}\right)^3 \frac{d}{dx}\left[\frac{x+2}{1-2x}\right] = 4\left(\frac{x+2}{1-2x}\right)^3 \frac{(1-2x)(1)-(x+2)(-2)}{(1-2x)^2}$$

$$= \frac{20(x+2)^3}{(1-2x)^5}.$$

For the second function, we have

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

$$= \frac{(2x^2+1)^3}{\sqrt{x}} + 24x\sqrt{x}(2x^2+1)^2.$$

7) Statement 1: False. If demand is elastic, raising prices will lower revenue.
Statement 2: True.
Statement 3: True.
Statement 4: False. If $h(x) = f(3x)$, then $h''(x) = 9f''(3x)$.

8) We have $h'(x) = 3f'(x) - 2g'(x) - 1$, so $h'(2) = 3(1) - 2(0) - 1 = 3 - 0 - 1 = 2$.