Practice Test 2
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) Find the derivative of the following functions. You do not need to simplify your answers. (1pts each)

- $f(x) = \left(\dfrac{3x^2 - x}{-x^2 - 5x}\right)^3$

- $g(x) = 3(2x - \sqrt{x})\sqrt{x^5 - 3x + 1}$

- $h(d) = \dfrac{1}{d^{-}3} + 5d^2 - 1$

2) Suppose that $h(1) = -1$, $h'(1) = 4$, $f(1) = -2$, $f'(1) = 2$, $f(-1) = 3$, and $f'(-1) = \frac{1}{2}$. Calculate $\dfrac{d}{dx}\left[[(f \circ h)(1)] \cdot f(1)\right]$ (2pts).

3) The percentage of married couples without children between 1970 and 2000 is given by

$$P(t) = \frac{54.1}{t^{0.27}} \qquad (1 \leq 4)$$

where t is in decades and $t = 1$ corresponds to 1970. What is the percentage of married couples without children in 1985? 2000? What was the rate of change of the percentage of married couples without children in 1995? Give units. (2pts)

4) Determine if each of the statements is true or false. If the statement is false, provide a counterexample or explain why the statement must be false. (1pt each)

- If $g(x) = (h \circ f)(x)$, then $g'(x) = (h' \circ f')(x)$.

- If $\overline{P}(x)$ is an average profit function and $\overline{P}'(A) = B$ for some production level A and some non-positive number B, then production should never be increased.

5) The quantity demanded of a certain product x and the unit price for the product p are related through the equation $0.8x + p - 40 = 0$. Compute the elasticity of demand at $p = 10$ and determine if demand is elastic, inelastic, or unitary at this price. (2pts)

6) If $f(x) = g(x^2)$, write an expression for $f''(x)$. (2pts)

7) The price of a pedicure at Nail Star is related to the daily quantity supplied by the equation

$$p - \frac{1}{8}x^2 = 15, \qquad (p \geq 15).$$

How fast is the daily price changing if the quantity supplied is increasing by 1 pedicure per day, the current prices is \$65, and the current quantity demanded is 20 pedicures per day? (2pts)

8) Use differentials to approximate the value $\sqrt[5]{32.2}$. (2pts)

Bonus: There will be a bonus question worth 0.5pts.