

### OPRE 6304 Fall 2024 Homework 4 (80 points)

(Homework 4 will be due on Oct 31<sup>st</sup>, Thursday, 11:59pm (CT). Please submit a single PDF write-up including answers to all questions on eLearning, and attach the Excel/R script files to your submission)

1. **(10 points)** Derive the price elasticity function  $\epsilon(p)$  for a logit price-response function  $d(p) = D \frac{e^{-(a+bp)}}{1+e^{-(a+bp)}}$ .
2. **(20 points)** A bookstore owner currently sells a popular writing software package for \$129.99, which costs them \$89.00 wholesale. They've calculated the price elasticity of demand for this software to be 3.9 at the current sales price.
  - a. To maximize net contribution, should the owner increase, decrease, or keep the price the same? (10 points)
  - b. If the elasticity estimates of 3.9 remains consistent within a price range of \$15.00 above or below the current price, what is the optimal price point for the owner to set? (10 points)
3. **(20 points)** A bicycle manufacturing company can produce electric bikes at an incremental cost of \$400 each. The company's market research has identified a logit price-response function for the upcoming month's sales, where  $d(p) = D \frac{e^{-(a+bp)}}{1+e^{-(a+bp)}}$ , characterized by parameters  $D = 5,000$ ,  $b = 0.005$ . The market research team has also identified that the demand for the electric bikes is 2,500 when price is \$1,400.
  - a. At what price should the company set its electric bikes to maximize net contribution? (10 points)
  - b. Based on this optimal pricing strategy, how many electric bikes is the company expected to sell in the month? (10 points)
4. **(30 points)** Julia runs a coffee cart in the JSOM. It costs her \$1 to produce each cup of coffee, and she observes a linear price-response function  $d(p) = (180 - 20p)^+$  for her coffee each day.
  - a. Find the price per cup that maximizes Julia's net contribution, along with the resulting contribution. (5 points)
  - b. Suppose large coffee chain proposes a deal to supply her with unlimited brewed coffee daily for a fixed cost of K dollars per day. If Julia agrees to this arrangement, what would be the optimal price per cup? (10 points)
  - c. At what fixed cost K values would entering into this contract increase Julia's profits? (5 points)
  - d. The chain now modifies the offer to a fixed daily cost of \$50, but limits the supply to a maximum of 80 cups of coffee per day. Should Julia accept this revised proposal? Justify your answer. (10 points)