Name: _____   **Be sure to show your work!**

1. (____/25 points) Sven's Import Sofa Emporium has determined that sofa prices and quantities demanded obey the following law: $p(q) = -325 \ln(q) + 2500$. In addition, Sven's costs seem to match the function: $C(q) = 0.5q^2 - 50q + 75000$.

    (a) Define Sven's revenue function, $R(q)$, in Maple.

        What did you type in Maple? [⟩_____

    (b) Enter Sven's cost function, $C(q)$, in Maple.

        What did you type in Maple? [⟩_____

    (c) Define Sven's profit function, $P(q)$, in Maple.

        What did you type in Maple? [⟩_____

    (d) Sven has determined that he cannot sell more than 350 sofas (that is $0 \leq q \leq 350$). Determine all of the critical points of Sven's profit function. If we wish to determine how many sofas Sven should sell to maximize his profit, which values of q should we plug into $P(q)$?

        $q =$ _____

    (e) How many sofas should Sven sell to maximize his profit? _____
        (Note: I want a **practical** answer not an **ideal** answer.)

2. (____/30 points) Phil sells a lot of goldfish. Suppose that Phil can buy a goldfish for \$0.50 but it costs Phil \$0.25 to store a goldfish for 1 year (base inventory costs on average inventory). Also, Phil must pay \$10 to get his goldfish delivered to his store.

    (a) If Phil sells 200 goldfish each year, define Phil's annual cost function, $C(x)$, in Maple.

        What did you type in Maple? [⟩_____

    (b) If Phil sells 200 goldfish each year, what is Phil's optimal order size? x = _____

    (c) Suppose that if Phil makes an order of 350 or more goldfish, then he can buy them for \$0.35 each. However, his shipping charge increases to \$15 per order (for orders of 350 or more fish). Define Phil's annual cost function, $C(x)$, in Maple, if Phil sells 1,000 goldfish each year.

        What did you type in Maple? [⟩_____

    (d) Under the assumptions from part (c), determine Phil's optimal order size: x = _____

3. (_____/**20 points**) Wendy owns Striped Shirts Unlimited. She has found that when she charges $5 for her shirts, she can sell 200 shirts. On the other hand if she charges $10 for her shirts, she can sell only 120 shirts.

  (a) Determine elasticity from this data. What should Wendy do to increase revenue?

  (b) Suppose that Wendy has found that quantities sold and prices are related by $p(q) = 28.284e^{-0.009q}$. Determine Wendy's point elasticity if she sets a price of $p = \$11.50$ per shirt. What shoud Wendy do to increase revenue?

4. (_____/**25 points**) Suppose that you have $100,000 in your retirement account. Your financial advisor tells you that you should invest your savings in stocks, bonds, and mutual funds. Being concerned about the current state of the economy, you decide that you should keep at least as much invested in bonds as the sum of your investments in stocks and mutual funds. In addition, you decide that you should keep at least as much invested in mutual funds as invested in stocks. Suppose that stocks return on average 10%, mutual funds return 8% on average, and bonds return 5%. How much should you invest in...

  (a) Stocks? _____

  (b) Mutual Funds? _____

  (c) Bonds? _____

  (d) Explain how you found your answer. List your constraints.