

3. [16 points] Eddie and Laura have signed an exclusive contract to begin producing the world's first caffeinated soup, called Minestromnia. If they charge \$4.00 per liter or more for the soup, then nobody will buy it. Otherwise, if they charge  $p$  dollars per liter for the soup, they will sell  $g(p)$  liters, where

$$g(p) = 500(16 - p^2).$$

- a. [3 points] Write an expression for the revenue  $R(p)$  that Eddie and Laura will generate if they charge  $p$  dollars per liter of soup.
- b. [3 points] The ingredients in a liter of Minestromnia cost \$1.00. To start their business, Eddie and Laura need to purchase a very large soup kettle and other equipment at a total cost of \$700.00. Write an expression for the total cost  $C(p)$ , including fixed costs, of producing  $g(p)$  liters of soup.
- c. [6 points] What price should Eddie and Laura charge per liter of Minestromnia in order to maximize their profits? Be sure to explain how you know that this price produces the maximum possible profit.

**3.** (continued)

**d.** [4 points] Give a practical interpretation of the formula

$$g'(3.5) = -3500$$

that begins with

“If Eddie and Laura decrease the price of the soup from \$3.50 per liter to \$3.40 per liter ...”

**4.** [6 points] A car, initially going 100 feet per second, brakes at a constant rate (constant negative acceleration), coming to a stop in 8 seconds. Let  $t$  be the time in seconds after the car started to brake.

**a.** [3 points] Sketch a graph of the velocity of the car from  $t = 0$  to  $t = 8$ , being sure to include labels.

**b.** [3 points] Exactly how far does the car travel? Make it clear how you obtained your answer.