

Due at the start of class on Mon Nov 17, 2008.

Answer the following questions in groups of two, but turn in one solution sheet per student. Write neatly and orderly as points will be deducted for messy work. No work shown \Rightarrow partial/full credit not possible, so show as much work as possible.

1. Find two numbers whose product is a minimum, given that one number is five less than one-third the other, and justify your answer mathematically. (Hint: name the numbers you wish to find (e.g., using letters), and then find a relationship between them, so that you can solve for one in terms of the other. Next find a formula for the function you need to minimize and then follow the methods from class.)
2. The number of boxes of the breakfast cereal Nutty Fruity sold in a month is $5000e^{-0.5p}$ boxes, where p is the price per box in dollars. Determine the price that will result in the greatest consumer expenditure. (Note: consumer expenditure is the amount of money consumers will spend on Nutty Fruity.)
3. A bus company will charter a bus that holds 50 people to groups of 35 or more. If a group contains exactly 35 people, each person pays \$60. In larger groups, everyone's fare is reduced by \$1 for each person in excess of 35.
 - (a) What is the revenue, if the bus is chartered to 35 people? 36 people? 37 people? Write your answers each time in terms of the number of people.
 - (b) Find a formula for the revenue in terms of the number of people chartering the bus.
 - (c) Determine the size of the group(s) for which the bus company's revenue will be the greatest. (Note: you need to check that your answer makes physical sense & that it is correct as the physical constraints allow.)
4. It would not look good if the national Christmas tree in Washington DC toppled over. So the designers have placed a series of 10-foot-high support poles around the tree, each 25 feet away from the tree's stump. Each support wire runs from the ground to the top of the support pole to the top of the tree in one, continuous, straight line. What height should the tree be so that the length of wire used is a minimum? (Hint: see the method for Question 1 above, and note that a positive function is a minimum \Leftrightarrow its square is a minimum.)

