

Math 165 Spring 2009: Special Assignment Two
Due Wednesday, March 11, 2009, in Lecture

The Rules

- This assignment should be **typed**. For suggestions on typing, see
<http://www2.math.uic.edu/~lewis/math165/165type.pdf>
- Special Assignment Two is a **GROUP PROJECT**. All papers must be worked on and written up by groups of at least two and no more than four people. **TYPE** the group writeup. **Please use complete sentences to explain your work and answers.** For graphs, you may attach neat free hand sketches with enough labels for an outsider to understand the graph. Groups may assign tasks, but each member is responsible for understanding all parts of the assignment. The last paragraph should summarize the roles and activity of each group member.
- Please note: Using the results of another group without acknowledgment is considered academic dishonesty and will be severely punished.
- Turn in both the **WARMUP** and the **Main Course**.
- **Group Members may be in Different Sections or Lectures.**
- Every group should fill in and attach:
<http://www2.math.uic.edu/~lewis/math165/165sa2groupmembers.pdf>.

Please use complete sentences to explain your work and answers.

WARMUP – Turn In!

Minimization for Some Very Special Functions

W1. Show that the absolute minimum value for the function

$$y = x + \frac{1}{x}$$

on the interval $x > 0$ occurs when

$$x = \frac{1}{x}.$$

W2. Show that the absolute minimum value for the function

$$y = \pi x + \frac{4}{x}$$

on the interval $x > 0$ occurs when

$$\pi x = \frac{4}{x}.$$

W3. Show that the absolute minimum value for the function

$$y = 4x + \frac{\pi}{x}$$

on the interval $x > 0$ occurs when

$$4x = \frac{\pi}{x}.$$

Main Course

M1. Let A and B be positive constants. Show that the absolute minimum value for the function

$$y = Ax + \frac{B}{x}$$

on the interval $x > 0$ occurs when

$$Ax = \frac{B}{x}.$$

M2. (Section 3.5, Problem 38, Variation) For speeds between 40 and 65 mph (miles per hour), a truck gets $480/x$ mpg (miles per gallon) at a constant speed of x mph. Diesel gasoline costs \$2.24 per gallon and the driver is paid \$24 per hour. What is the most economical constant speed between 40 and 65 mph at which to drive the truck?

Hint: Pay attention to **Step 1** of the Guidelines on p. 254 – deciding precisely what you want to minimize.

M3. (Section 3.5, Problem 42) A truck is hired to transport goods from a factory to a warehouse. The driver's wages are figured by the hour and so are inversely proportional to the speed at which the truck is driven. The amount of fuel used is directly proportional to the speed at which the truck is driven, and the price of gasoline remains constant. Show that the total cost is smallest at the speed for which the driver's wages are equal to the cost of the gasoline used.

M4. Through its rest stops, an State Department of Tourism gives out 16000 road maps per year. The cost of setting up a press to print the maps is \$200 for each production run. In addition, production costs are 12 cents per map and storage costs are 40 cents per map per year. The maps are distributed at a uniform rate throughout the year and are printed in equal batches timed so that each arrives just as the preceding batch is used up. How many maps should be printed in each batch to minimize cost? How many times per year should the maps be distributed?

Remember the Rules. The last paragraph of your typed writeup should summarize the roles and activity of each group member.