Notes:

Each week the homework problems will follow a theme; this week the theme is transportation. If you feel one of the questions is ambiguous and could mean more than one thing, explain what you feel is ambiguous or misleading, pick a sensible interpretation of the question, and answer it. Feel free to ask either the TA or the instructor about problems, too; usually we’ll make up a similar problem and work through its solution with you. You can talk to other students in the class about the problems too, but must write up your own solutions.

Exercise (1)
A morning commuter drives to drop off two children at different schools, stops off at a drugstore to buy some aspirin, and goes to work. Some of these errands can be done in any order, some can’t. In how many different orders could the commuter make these four stops?

Exercise (2)
We have a list of the departure times for four morning commuters, and also a list of their arrival times at work, but unfortunately we don’t have actual trip records that would tell us which departure goes with which arrival. The four departure times are 9:03, 6:55, 7:30, and 6:25; the four arrival times are 8:30, 7:20, 10:00, and 9:30 (all times are am, same time zone). How many possible pairings are there of departure and arrival times?

Exercise (3)
Factorials get large quite quickly; most calculators overflow at around 69! (a little smaller than 10^{100}), while C or Fortran programs will overflow at around 35 or 179 in single- and double-precision, respectively. Show that for every \( x > 0 \), \( \lim_{n \to \infty} (n!/x^n) = \infty \), and also show that \( \lim_{n \to \infty} (n!/n^n) = 0 \). Thus for any constants \( a, b > 0 \), eventually \( a x^n < n! < b n^n \).

Exercise (4)
Ross, Chapter 1, problem 21 (p. 18).

Exercise (5)
Ross, Chapter 1, problem 22 (p. 18).

Exercise (6)
Ross, Chapter 1, exercise 13 (p. 21).