MATH 251 (PHILLIPS): WRITTEN HOMEWORK 7 PART 1.

This homework sheet is due in class on Wednesday 14 May 2025 (week 7), in class. Write answers on a separate piece of paper, well organized and well labelled, with **each solution starting on the left margin of the page**.

All the requirements in the sheet on general instructions for homework apply. In particular, show your work (unlike WeBWorK), give exact answers (not decimal approximations), and **use correct notation.** (See the course web pages on notation.) Some of the grade will be based on correctness of notation in the work shown.

For each of the following problems, do the following.

(1) Draw a picture of the situation.
(2) Name all quantities you will need to use in the solution. Include the units with the names, as in the example below. Label items in the picture with the names of the appropriate variables.
(3) Determine all the relations between the quantities in (1). Write the these relations as equations.

Do not attempt any further steps towards solving the problem.

See the example for Written Homework 5.

10 points per problem, total 30 points.

1. A 31 inch long wire will be cut in three pieces. Two of the pieces will be the same length, and will be to form the perimeters of two squares, of course of the same size. The other piece will be used to form the perimeter of a circle. How should the wire be cut to minimize the combined area of the three shapes?

2. A thin film is to be used to form the surfaces of a sphere and a cube. If you are supposed to use exactly 11 square feet of this film, how should the film be divided to minimize the combined volume of the two objects? Assume there is no waste.

3. A dog is standing on a straight lakeshore. A robot throws a stick in the water, which lands 10 feet away from the shoreline, with the closest point on the shoreline being 13 feet away from the dog. The dog runs at 23 feet per second and swims at 3 feet per second. Find the fastest route the dog can take to the stick. (The dog will run along the shore to some point, and then swim diagonally to reach the stick.)

Date: 11 May 2025.