Problem 1 (15 pts)**.** A rectangular area of 3200 ft^2 is to be fenced off. Two opposite sides will use fencing costing \$1 per foot and the remaining sides will use fencing costing \$2 per foot. Find the dimensions of the rectangle of least cost.

Dimensions of rectangle of least cost: [ ]

Problem 2 (15 pts)**.** Grain pouring from a chute at the rate of 8 ft^3/min forms a conical pile whose height is always twice its radius. How fast is the height of the pile increasing at the instant when the pile is 6 ft high?

Height of pile increasing at a rate of: [ ]

Problem 3 (15 pts)**.** A 17-ft ladder is leaning against a wall. If the top of the ladder slips down the wall at a rate of 2 ft/s, how fast will the foot be moving away from the wall when the top is 5 ft above the ground?

Foot moving away at a rate of: [ ]

Problem 4 (15 pts)**.** A box with a square base is taller than it is wide. In order to send the box through the U.S. mail, the height of the box and the perimeter of the base can sum no more than 108 in. What is the maximum volume for such a box?

Largest volume: [ ]

Problem 5 (15 pts)**.** At noon, ship **A** is 150 km west of ship **B**. Ship **A** is sailing east at 35 km/h and ship **B** is sailing north at 25 km/h. How fast is the distance between the ships changing at 4:00 PM?

Distance changing at a rate of: _____

Problem 6 (15 pts)**.** A church window consisting of a rectangle topped by a semicircle is to have a perimeter p. Find the radius of the semicircle if the area of the window is to be maximum.

Semicircle radius: _____