In-Class Assignment 6

MATH 141

Directions: Work neatly on a separate sheet of paper. Your group will hand in one write-up with everyone's name on it. **DO NOT** fold the corner over to hold everything together! Your final write-up should be very neat and well-written. Remember to use complete sentences as appropriate.

Work together on each problem; do not delegate different problems to different people.

1. Find the dimensions of a rectangle with area 400m^2 whose perimeter is as small as possible.
2. Find the point on the line $y = 4x + 7$ that is closest to the origin.
3. An oil refinery is located on the north bank of a straight river that is 2 km wide. A pipeline is to be constructed from the refinery to storage tanks located on the south bank of the river 6 km east of the refinery. The cost of laying pipe is \$400,000/km over land and \$800,000/km under the river to the tanks. To minimize the cost of the pipeline, how far east should the builders lay pipe over land before going under water to the tanks? [Hint: the distance should be between 0 and 6 km.]
4. A right circular cylinder is inscribed in a sphere of radius r. Find the largest possible surface area of such a cylinder.
5. At which points on the curve $y = 1 + 40x^3 - 3x^5$ does the tangent line have the largest slope?
6. Two vertical poles PQ and ST are secured by a rope PRS going from the top of the first pole to a point R on the ground between the poles and then to the top of the second pole as in the figure. Show that the shortest length of sucha rope occurs when $\theta_1 = \theta_2$.