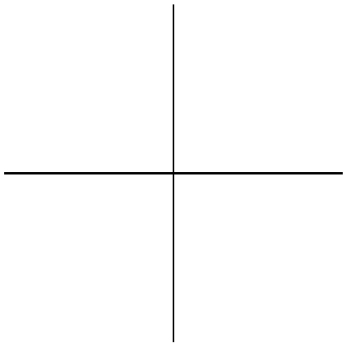
Group: _____ _____ _____ Name: _____

Math 231 A. Worksheet 9.

1. The Hoover Dam near Las Vegas has "penstock gates" to control the flow of water. They are circular, approximately 5 meters in radius, and are centered 90 meters under water.

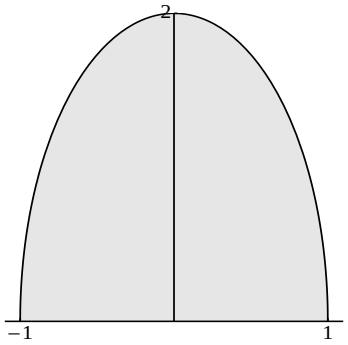
a) Make a clear diagram of this problem. Include a "ruler" to the right which clearly indicates the meaning of your coordinates.



b) Compute the hydrostatic force on on of these gates to two significant figures. Use 9.8 m/s^2 for the gravitational constant and 1000 kg/m^3 for the density of water. **Hint:** You can evaluate all integrals which arise in your head, without any hard work.

c) The mass of a loaded 747 airplane is approximately $400,000$ kg. Find the weight of a 747 in Newtons. How many 747s would it take to provide the force you computed in part (b)?

2. A lamina with area density λ kg/m^2 occupies the top half of the ellipse $4x^2 + y^2 = 4$ as shown. You may use the fact that the area of the lamina is π m^2. Find the moments M_x and M_y about the x and y axes, respectively. Then find the coordinates $(\overline{x}, \overline{y})$ of the centroid. You may use any available symmetries.



3. A lamina has the shape of a right triangle of height L and base r (meters). The base lies along the x-axis. It has density ρ kg/m^2.

a) Make a careful diagram of the problem (like the one on the last page).

b) Find the moment M_x about the x axis. Your answer will involve ρ, L, and r.