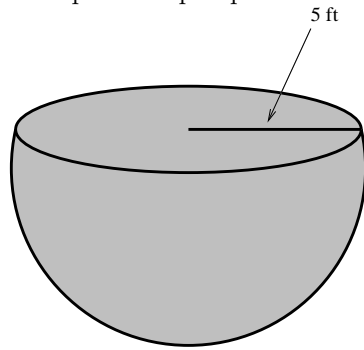


## Assignment # 5

Due 7-3-06

- (1) A spring has a natural length of 20 cm. If a 25-N force is required to keep it stretched to a length of 30 cm, how much work is required to stretch it from 20 cm to 25 cm?
- (2) The tank shown if full of water. Given that water weighs  $62.5 \frac{\text{lb}}{\text{ft}^3}$ , find the work required to pump the water out of the tank.



For this problem, place your axes at the bottom of the hemisphere.

Evaluate your integral with technology.

- (3) Please download the direction Field for the differential equation  $y' = x \sin y$ .

The link for this is below the homework assignment on the website.

- (a) On your downloaded copy, sketch the graphs of the solutions that satisfy the given initial conditions. Include this with your homework.

(i)  $y(0) = 1$

(ii)  $y(0) = 2$

(iii)  $y(0) = \pi$

(iv)  $y(0) = 4$

(v)  $y(0) = 5$

(b) Find all the equilibrium solutions.

(4) Consider the differential equation  $y' = x - xy$ .

(a) Sketch the direction field of the differential equation for integer values of  $x$  and  $y$  in the intervals  $-3 \leq x \leq 3$  and  $-3 \leq y \leq 3$ . Draw it neatly!

(b) Use your slope field in part a) to sketch a solution curve that passes through the point  $(1, 0)$ .

(5) Use Euler's method with step size 0.2 to estimate  $y(1)$ , where  $y(x)$  is the solution of the initial-value problem

$$y' = 1 - xy \quad y(0) = 0.$$

Note that  $y(1)$  is the fifth iteration of Euler's Method. The first would give you  $y(.2)$ , the second  $y(.4)$ , and so on.