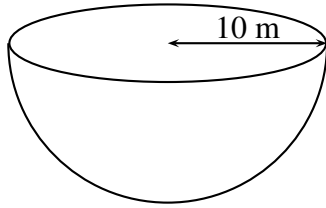6. (10 points) A tank has the shape of an open-top hemisphere with radius 10 m that is full of water with density 1000 kg/m^3. Set up an integral which computes the work required to empty the tank by pumping all of the water to the top of the tank. DO NOT EVALUATE THIS INTEGRAL.

7. (10 points) An 8 foot chain weighs 120 pounds. A large robot is holding one end of the chain 3 feet above the ground, so that 5 feet of the chain are on the ground. How much work must the robot do to lift this end of the chain from a height of 3 feet to a height of 10 feet?

7. (8 total points)

   The electric force (in Newtons) acting on a charged particle A as a result of the presence of a second charged particle B is given by Coulomb's Law

   $$F = \frac{k q_A q_B}{r^2},$$

   where r is the distance (in meters) between the particles, q_A and q_B are the charges of A and B in Coulombs, and $k = 9 \times 10^9$ is a constant.

   Assume that two particles A and B have opposite charges, with $q_A = 1$ Coulomb and $q_B = -1$ Coulomb. (The force F is negative, indicating that the particles are attracting each other.) Assume that particle A is kept fixed, and that the initial distance between the two particles is 1 meter.

   (a) (4 points) Find the work done to move particle B from its initial position to a position 2 meters away from particle A.

   (b) (4 points) Find the work done to move particle B from its initial position to an infinite distance away from particle A.

8. (8 points) A small circular pool has a radius of 10 ft, the sides are 3 ft high, and the depth of the water is 2 ft. How much work (in ft-lb) is required to pump all of the water out over the side of the pool? (Water weighs 62.5 lb/ft^3.)

6. (10 points) A container has the shape of an inverted circular cone with height 10 feet and top radius 4 feet. It is filled with a liquid weighing 60 lb/ft³. Find the work required to pump the top 5 feet of the liquid to the top of the container, and give your answer in decimal form.
   Please label your origin and coordinate axis on the figure.