Calculus I
Practice Problems 13

1. Find the work done in pumping all the oil (whose density is 50 lbs. per cubic foot) over the edge of a cylindrical tank which stands on end. Assume that the radius of the base is 4 feet, the height is 10 feet and the tank is full of oil.

2. John Brown has a parabolic cistern in the ground with a depth of 12 feet and a diameter at the top of 4 feet. This can be viewed as formed by revolving the curve $y = 3x^2$ around the y-axis, where the line $y = 12$ represents ground level. How much work does it take to pump out the cistern when it is full of water (the density of water is 62.5 lb/ft^3)?

3. A cylindrical reservoir of base radius 50 feet and height 15 fee is built 300 feet above the surface level of a lake. How much work is required to fill the reservoir with lake water (assuming the lake is large enough that its surface level does not change during this process)? Recall that the density of water is 62.5 lb/ft^3.

4. A 2 lb. weight will extend a certain spring 5 inches. How much work is done in extending the spring 14 inches?

5. A 10 kg mass extends a spring 45 cm, to a new equilibrium position. The spring is then extended another meter and released. With what velocity does it pass the equilibrium position?

6. FInd the center of mass of the homogeneous region in the first quadrant bounded by the curve $x^4 + y = 1$.

7. Find the center of mass of the region bounded by the curves $y = x - x^3$ and $y = x - x^2$.