

Quiz Date: October 11, 2017

**Instructions:** The following exercises are similar to those found in the course text book. This homework is not due for a grade, but you should know how to do all of them and be able to show your work for each. You can expect at least one of these problems to appear on an in-class quiz on the date listed above.

## 7.4 - Arc Length

Find the length of the following curves on the given intervals.

1.  $y = \sqrt{2 - x^2}$ ,  $0 \leq x \leq 1$
2.  $y = 1 + 6x^{3/2}$ ,  $0 \leq x \leq 1$
3.  $y = \ln(\sec x)$ ,  $0 \leq x \leq \frac{\pi}{4}$
4.  $y = \frac{1}{4}x^2 - \frac{1}{2}\ln(x)$ ,  $1 \leq x \leq 2$

## 7.6 - Applications to Physics and Engineering

5. Hooke's Law states that the force required to stretch a string a distance of  $x$  beyond its natural length is given by  $f(x) = kx$ , where  $k$  is the *spring constant*. A force of 10 lb is required to hold a spring stretched 4 in. beyond its natural length. How much work is done in stretching it from its natural length to 6 in. beyond its natural length?
6. A chain lying on the ground is 10 m long and its mass is 80 kg. How much work is required in to raise one end of the chain to a height of 6 m?
7. A tank full of water has the shape of a paraboloid with top diameter 4 ft and height is 4 ft, as shown in Figure ??
  - a. How much work is required to pump all of the water out of the tank?
  - b. After 4000 ft-lb of work has been done, what is the dept of the water remaining in the tank?

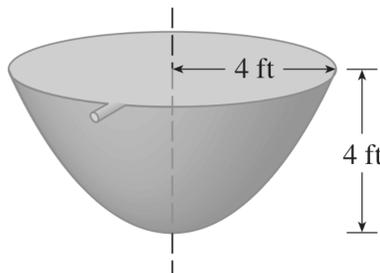


Figure 1: Paraboloid Tank