Quiz Date: October 16, 2018

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 the exercises 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.

7.3 - Volumes by Cylindrical Shells

1. Use the method of cylindrical shells to find the volume of the solid obtained by rotating the region bounded by the set of curves $\{y = x^3,\, y = 0,\, x = 1,\, x = 2\}$ around the y-axis.

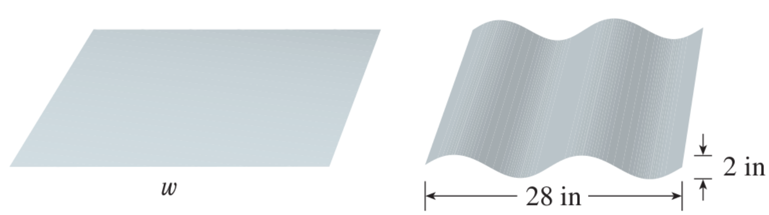
2. Use the method of cylindrical shells to find the volume of the solid obtained by rotating the region bounded by the set of curves $\{y = 4x - x^2,\, y = 3\}$ about the line $x = 1$.

7.4 - Arc Length

3. A steady wind blows a kite due west. The kite's height above the ground from the horizontal position $x = 0$ to $x = 80\,\text{ft}$ is given by $y = 150 - \frac{1}{40}(x - 50)^2$. Find the distance traveled by the kite.

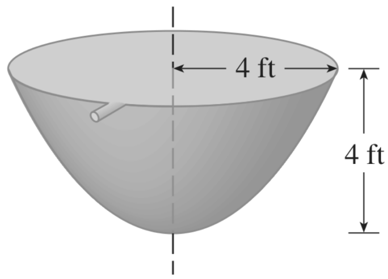
4. A hawk flying at $15\,\text{m/s}$ accidentally drops its prey. The parabolic trajectory of the falling prey is described by the equation $y = 180 - \frac{1}{45}x^2$ until it hits the ground, where y is its height above the ground and x is the horizontal distance traveled in meters. Calculate the distance traveled by the prey from the times it is dropped until the time it hits the ground. Express your answer correct to the nearest tenth of a meter.

5. A manufacturer of corrugated metal roofing wants to produce parallel panels that are 28 in wide and 2 in thick by processing flat sheets of metal shown in the figure below. The profile of the roofing takes the shape of a sine wave. From the figure we see that the sine curve has equation $y = \sin(\pi x/7)$. Use this to find the width w of a flat metal sheet that is needed to make a 28-inch panel. Evaluate the integral correct to four significant digits.



7.6 - Applications to Physics and Engineering

6. A tank full of water has the shape of a paraboloid with top diameter 4 ft and height is 4 ft, as shown in the figure below.



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 depth of the water remaining in the tank?