MTH142 Workshop 8: Work

1. 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?

2. Suppose that 24 J of work is needed to strech a spring from its natural length of 30 m to a length of 42 m.

   (a) How much work is needed to stretch the spring from 35 m to 40 m?

   (b) What force is needed to hold the spring stretched to 42 m?

   (c) How far beyond its natural length will a force of 5 N keep the spring stretched?

3. A cable that weighs 2 lb/ft is used to lift 800 lb of coal up a mine shaft 500 ft deep. Find the work done.

4. A bucket that weighs 4 lb and a rope that weighs 0.5 lb/ft are used to draw water from a well that is 80 ft deep. The bucket is filled with 40 lbs of water and is pulled up at a rate of 2 ft/s, but water leaks out of a hole in the bucket at a rate of 0.2 lb/s. Set up the integral to calculate the work done in pulling the bucket to the top of the well.

5. A circular swimming pool on certain planet, which has a gravitational constant of 10 m/s^2, has a radius of 4 m and a height of 3 m. The water in the pool is filled to 2 m. How much work must be done to empty the pool by pumping the water over the side? (Note that the density of water on any planet is always 1000 kg/m^3.)

6. A tank is full of water. Find the work required to pump the water out of the spout.