Here are a set of problems for my Calculus I notes. These problems do not have any solutions available on this site. These are intended mostly for instructors who might want a set of problems to assign for turning in. I try to put up both practice problems (with solutions available) and these problems at the same time so that both will be available to anyone who wishes to use them.

As with the set of practice problems I write these as I get the time and some sections will have only a few problems at this point and others won’t have any problems in them yet. Rest assured that I’m always trying to get more problems written but this site has been written and maintained in my spare time and so I usually cannot devote as much time as I’d like to the site.

1. A force of \( F(x) = xe^{-2x^2} + 6x - 2 \) acts on an object. What is the work required to move the object from \( x = 1 \) to \( x = 4 \) ?

2. A force of \( F(x) = 4\cos(2x) - 7\sin\left(\frac{x}{2}\right) \), \( x \) is in meters, acts on an object. What is the work required to move the object 8 meters to the right of \( x = 2 \) ?

3. A force of \( F(x) = \sin(x)e^{\cos(x)} - 4x + 1 \), \( x \) is in meters, acts on an object. What is the work required to move the object 6.5 meters to the left of \( x = 9 \) ?

4. A spring has a natural length of 25 cm and a force of 3.5 N is required to stretch and hold the spring to a length of 32 cm. What is the work required to stretch the spring from a length of 30 cm to a length of 45 cm?

5. A spring has a natural length of 9 inches and a force of 7 lbs is required to stretch and hold the spring to a length of 21 inches. What is the work required to stretch the spring from a length of 12 inches to a length of 30 inches?

6. A cable that weighs 2 kg/meter is lifting a load of 50 kg that is initially at the bottom of a 75 meter shaft. How much work is required to lift the load 40 meters?
7. A cable that weighs 1.5 kg/meter and is attached to a bucket that weighs 75 kg. Initially there are 500 kg of grain in the bucket and as the bucket is raised 2 kg of grain leaks out of a hole in the bucket for every meter the bucket is raised. The bucket is 200 meters below a bridge. How much work is required to raise the bucket to the top of the bridge?

8. A tank of water is in the shape of a cylinder of height 25 meters and radius of 7 meters. If the tank is completely filled with water how much work is required to pump all of the water to the top of the tank. Assume that the density of water is 1000 kg/m$^3$.

9. A tank of water is in the shape of an inverted pyramid that is 18 feet tall and whose top is a square with sides 4 feet long. If there is initially 12 feet of water in the tank determine the amount of work needed to pump all of the water to the top of the tank. Assume that the density of water is 62 lb/ft$^3$.

10. A tank of is the shape of the lower half of a sphere of radius 6 meters. If the initial depth of the water is 4 meters how much work is required to pump all the water to the top of the tank. Assume that the density of water is 1000 kg/m$^3$. 