

Homework Set 25: Work

Spring Problems

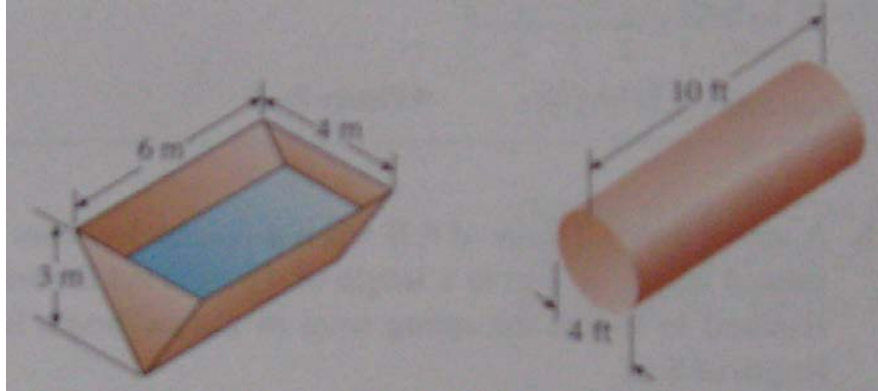
1. A linear spring exerts a force of 5 N when stretched 1 cm beyond its natural length. How much work will be required to stretch it another 2 cm?
2. A nonlinear spring exerts a force $F(x) = 18x^3$ Newtons for an extension of x cm beyond its natural length. How much work will be required to extend it 4 cm beyond its natural length?

Lifting Problems

3. A bucket weighing 1000 pounds is to be lifted from the bottom of a shaft 20 feet deep. The weight of the cable used to hoist it is 10 pounds per foot. How much work is done lifting the bucket to the top of the shaft?
4. A dredger scoops a shovel full of mud weighing 2000 pounds from the bottom of a river and then lifts it at a constant rate. As the scoop is raised water leaks out uniformly so that half the weight of the contents is lost when the scoop has been lifted 25 feet. How much work is done by the dredger in lifting the mud this distance?

Pumping Problems

5. The vat on the left below contains 2 m of water (weight density 9810 N/m^3). Find the work required to pump all the water to the top of the vat.



6. The cylindrical tank on the right above is filled with a liquid weighing 50 lb/ft^3 . Find the work required to pump all the liquid to a level 1 foot above the top of the tank.