Work (HW #2)

The work W done on an object by a constant force F parallel to a displacement of the object d is defined to be

$$W = Fd.$$

If the force is in the same direction as the displacement, work will be positive; if in the opposite direction, work will be negative.

Quantity	Metric Units	English Units
Force $= F$	Newtons (N)	pounds
Displacement $= d$	meters (m)	feet
Work $= W$	Joules (J)	foot-pound
mass $= m$	kilograms (kg)	slug
standard gravity $= g$	9.81 m/s^2	32 ft/sec^2

Newton's second law says

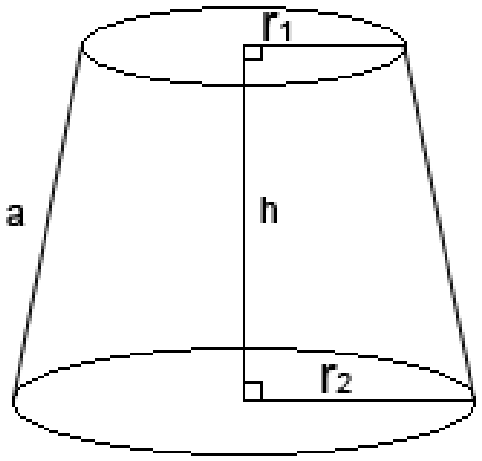
$$F = ma = \text{Mass times Acceleration}$$

where acceleration a is often g. I usually use a single significant digit for g: $g \approx 10$ m/s^2.

Find the work done by a man lifting
a) a 200 pound barbell six feet off the ground.
b) a 200 kg barbell two meters off the ground.

A 40 kg weight is pulled to the top of a 100 m building using a rope with linear density equal to 0.5 kg/m. How much work is done?

A tank has the shape of a frustrum of a cone with radii of three meters at the bottom and one meter at the top with a height of eight meters. It is filled with a fluid with density 1000 kg/m^3. The drain is clogged, so we must pump the fluid out of the top of the tank. How much work is done pumping all the fluid out?



Hooke's Law says the force F required to **hold** a spring x units from equilibrium is proportional to x. More briefly,

$$F = kx$$

A spring is 20 cm (or .20 m) long when it is at equilibrium. If a 25N force is required to hold the spring when stretched to 30 cm, how much work is needed to stretch it from 25cm to 35cm? Hint: this means displacement from equilibrium is from 5 to 10 cm.