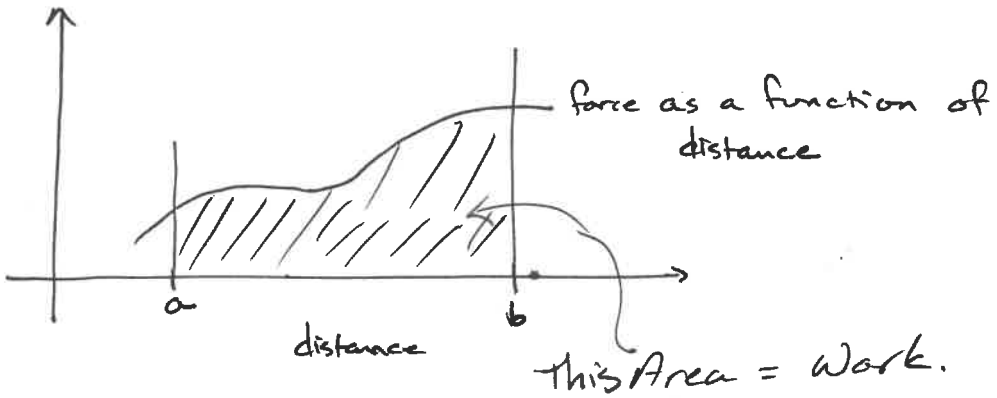
6.4 Work = Force • Distance

if force is constant.

But, what if force is <u>not</u> constant? Then work equals force integrated with respect to distance:

$$\text{WORK} = \int_a^b \text{force}(x)\,dx$$

WORK done in moving object from a to b



Metric Units

F = Force = mass · acceleration

= kg · m/sec^2

= N = Newton = 1 $\frac{kg \cdot m}{sec^2}$

d = distance = meters

W = work = Newton-meter

= J = Joule

g = acceleration due to gravity at Earth's surface

= 9.8 m/sec^2

"English" Units

F = force = pounds

d = distance = feet

W = work = foot-pounds

= ft·lbs.

1 ft·lb ≅ 1.36 J

g = acceleration due to gravity at Earth's surface

= 32 ft/sec^2

6.4 Work

WORK = FORCE • DISTANCE

ex How much work is done in lifting a 2 pound book from the floor onto a 3 foot table?

work = (force)(distance)

work = (2 lbs)(3 feet)

= 6 ft-lbs.

ex How much work is done in lifting a 12 kilogram dog onto a 1.5 meter tall counter?

work = (force)(distance)

= (mass • acceleration)(distance)

= (12 kg)(9.8 m/s²)(1.5 meters)

= (117.6 kg·m/s²)(1.5 meters)

N = Newton!

= 176.4 N-m

J = Joule!

Notice!

In metric:

Work = mass · accel · dist

J = kg · $\frac{m}{s^2}$ · m

In "English" units

Work = force · dist

ft-lbs = lbs · ft