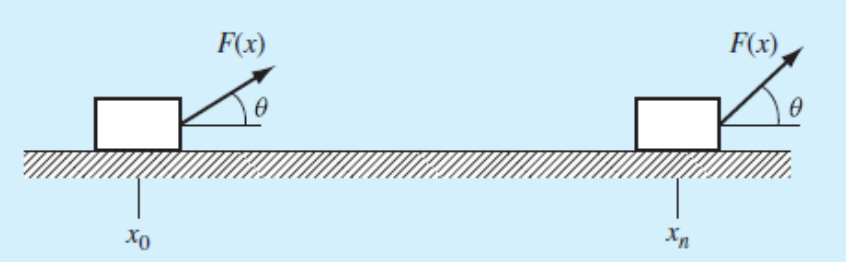
Calculus: Mechanical Work

The calculation of mechanical work is an important component of many areas of engineering and science. Suppose a block is being pulled with a force applied at an angle:



where x_0 and x_n are the initial and final positions (m), $F(x)$ is the force that varies as a function of position (N), and $\theta(x)$ is the angle at which the force is applied as a function of position (rad). The position, force, and angle of a block over time are given in the `ME2004_WorkData.mat` file. The general formula for the work W (J) is:

$$W = \int_{x_0}^{x_n} F(x)\cos\big(\theta(x)\big)\quad dx$$

a) Use the (Composite) Trapezoidal Rule with 1 segment to compute the work.
b) Calculate the percent error if $W_{true} = 129.52\ J$.
c) Repeat (a) and (b) for 2, 3 and 6 segments.