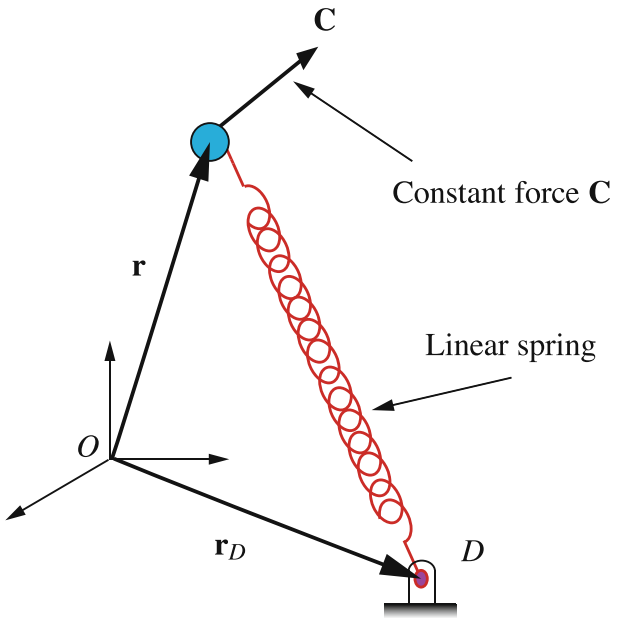
5.5 Examples of Conservative Forces

The two primary examples of conservative forces are:



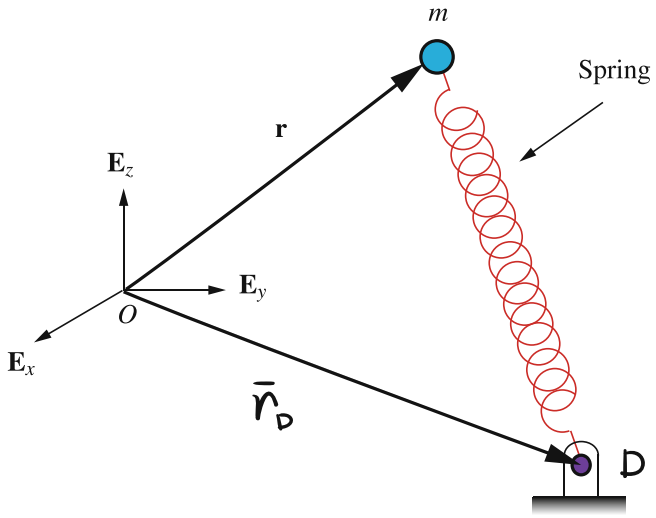
5.5.1 Constant Forces

Let's guess the form of a potential energy function for a constant force:

Check it by seeing if it satisfies:

E.g. Gravity:

5.5.2 Spring Forces



Recall that a spring force (with fixed point D) is given by

O'Reilly derives the potential energy for a spring forces $\bar{F}_s$:

5.6 Energy Conservation

Consider a particle acted on by the forces:

The conservative forces have potential energies U_i $(i \in \{1,\ldots,n\})$.

So the total resultant force on the particle is:

.

Aside: define the total energy

We can rewrite the work-energy theorem in terms of the total energy E. Starting with our original def.,

$\Rightarrow$

If the non-conservative forces do no work on the particle, i.e.,

Therefore

We typically use $\dot{E}=0$ to find a single unknown in a conservative motion of a particle.

E.g. Given a particle w/ initial speed v_0 and initial position $\vec{r}_0$, find the particle's velocity at another location $\vec{r}_1$. Assume only conservative forces act on the particle.