For particle motion in one dimension

If force is function of position x only
$F = F(x)$

Work done by force as particle goes $x_1 \rightarrow x_2$:
- Independent of how it goes (i.e., history, path, etc.)
- Depends only on end points x_1, x_2

$V(x)$ define as:

$$V(x) = -\int_{x_R}^{x} F(x)dx$$

- Is function of x only
- Independent of how it goes $x_R \rightarrow x$
- Scalar field: Potential Energy

Since E is conserved
Force is called *conservative*

Quantity $E = T + V(x)$ conserved
E = Total Mechanical Energy

May write:

$$F(x) = -\frac{dV(x)}{dx}$$

Non-conservative forces

- Total Mechanical Energy is NOT conserved
- Work depends on the how the particle goes $x_1 \rightarrow x_2$ (i.e., Work depends on history, path, etc.)
- NOT possible to define scalar field Potential Energy function that is path independent and that depends only on position.