

Work and Energy



Consider a block of mass m moving along the x -axis.

- Conservative force acting on block: $F = F(x)$
- Work done by $F(x)$ on block: $W_{if} = \int_{x_i}^{x_f} F(x)dx$
- Kinetic energy of block: $K = \frac{1}{2}mv^2$
- Potential energy of block: $U(x) = - \int_{x_0}^x F(x)dx \Rightarrow F(x) = -\frac{dU}{dx}$
- Transformation of energy: $\Delta K \equiv K_f - K_i$, $\Delta U \equiv U_f - U_i$
- Total mechanical energy: $E = K + U = \text{const} \Rightarrow \Delta K + \Delta U = 0$
- Work-energy relation: $W_{if} = \Delta K = -\Delta U$

