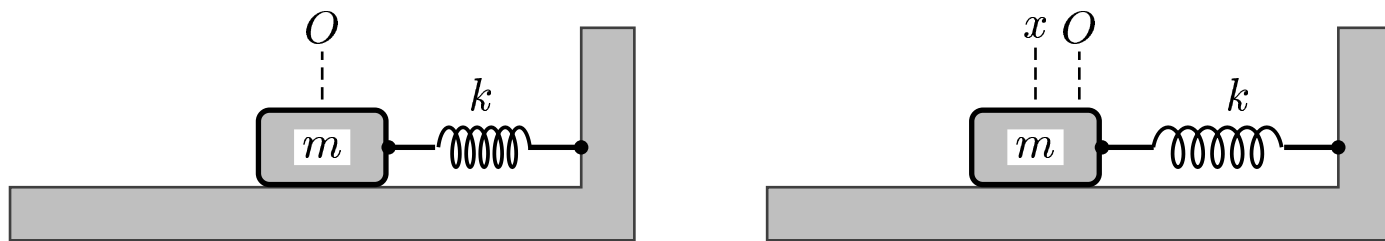


Consider a mass-spring system. The spring force is governed by Hooke's law $F_{spring} = -kx$. Denote the potential energy of the spring by $U(x)$. At O ($x = 0$), the spring is relaxed, and the potential energy $U(0) = 0$.



At x , $U(x)$ represents the work done against the spring force in going from O to x , which is given by

- A) $U(x) = -kx^2$.
- B) $U(x) = +kx^2$.
- C) $U(x) = +\int_0^x kx \, dx$.
- D) $U(x) = -\int_0^x kx \, dx$.

The force against the spring is $-F_{spring} = kx$.

So work done against the spring force from $x = 0$ to x is given by

$$U(x) = + \int_0^x kx \, dx = \frac{1}{2} kx^2.$$

Answer **C**.

07.03-01 Mass Spring System 2004-3-24