

University Physics 1A

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Work

Practice Problem

A force given by $F = (-3.0x + 2.0)N$ acts on an object that is initially at $x = 3.0m$. What is the work done by this force as the object is moved to $x = 5.0m$?

$$\begin{aligned}W &= \int F_x \, dx \\&= \int_3^5 (-3x + 2) \, dx \\&= \left. \frac{3x^2}{2} + 2x \right]_3^5 \\&= \frac{-3(5^2)}{2} + 2(5) - \left(-\frac{3(3^2)}{2} + 2(3) \right) \\&= -20J\end{aligned}$$

Practice Problem

A force $\vec{F} = (-Ax, -By^2)N$ acts on an object that is initially at rest at the origin. It travels only along the y-axis to $y = 4.0m$.

1. What are the units of A and B ?
 A is in $\frac{N}{m}$ and B is in $\frac{N}{m^2}$.

2. What is the work done by this force as the object is moved to $y = 4.0m$?

$$\begin{aligned}W &= \int F_y \, dy \\&= \int_0^4 -By^2 \, dy \\&= \left. \frac{-By^3}{3} \right]_0^4 \\&= \frac{-64B}{3} m^2\end{aligned}$$

Practice Problem

A force $\vec{F} = (-10, -5.0, -4.0)N$ acts on an object that is initially at the origin and moves to a position $\vec{r} = (2.0, 3.0, 0.0)m$. What is the work done on the object by this force during the motion?

$$\begin{aligned}W &= \vec{F} \cdot \vec{d} \\&= (-20) + (-15) + 0 \\&= -35J\end{aligned}$$

Work-Kinetic Energy Theorem

$$\begin{aligned}W &= \frac{1}{2}mv^2 \\W &= KE_f - KE_i\end{aligned}$$

You can find all my notes at <http://omgimanerd.tech/notes>. If you have any questions, comments, or concerns, please contact me at alvin@omgimanerd.tech