Modern Physics

A Collection of Notes and Problems

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Contents

Chapter 1

A Brief Review

1.1 Newton's Laws

We can express Newton's laws with a couple of equations.
The first main equation

$$\vec{F}_{net} = m\vec{a} = \frac{d\vec{p}}{dt}$$

where $\vec{a}$ is acceleration, m is mass, and $\vec{p}$ is momentum, given by $\vec{p} = m\vec{v}$.

Hooke's Laws

$$F = -kx$$

We can solve this differential equation to get

$$-kx = m\frac{d^2x}{dt^2}$$

Total momentum is conserved, described by

$$\vec{P}_{tot} = \text{ a constant vector}$$

1.2 Work and Energy

Total energy is conserved
Work, a scalar, is shown by

$$W = \int_{\vec{r}_i}^{\vec{r}_f} \vec{F} \cdot d\vec{r}$$