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**Manual Solutions Classical Mechanics Goldstein 3rd Edition**

Goldstein Classical Mechanics Notes

Michael Good  
May 30, 2004

## 1 Chapter 1: Elementary Principles

### 1.1 Mechanics of a Single Particle

Classical mechanics incorporates special relativity. 'Classical' refers to the contrast with quantum mechanics.

Velocity:

$$\mathbf{v} = \frac{d\mathbf{r}}{dt}$$

Linear momentum:

$$\mathbf{p} = m\mathbf{v}$$

Force:

$$\mathbf{F} = \frac{d\mathbf{p}}{dt}$$

In most cases, mass is constant and force is simplified:

$$\mathbf{F} = \frac{d}{dt}(m\mathbf{v}) = m\frac{d\mathbf{v}}{dt} = m\mathbf{a}$$

Acceleration:

$$\mathbf{a} = \frac{d^2\mathbf{r}}{dt^2}$$

Newton's second law of motion holds in a reference frame that is inertial or Galilean.

Angular Momentum:

$$\mathbf{L} = \mathbf{r} \times \mathbf{p}$$

Torque:

$$\mathbf{T} = \mathbf{r} \times \mathbf{F}$$

Torque is the time derivative of angular momentum:

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