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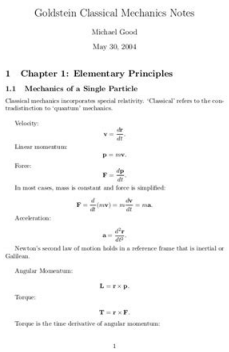

Goldstein Classical Mechanics Notes

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 contradistinction to '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:

1

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