

## Impulse-Momentum Theorem:

- Impulse:  $\bar{J} = \int \bar{F} dt$

- Momentum:  $\bar{p} = m\bar{v}$

- Impulse-momentum:

$$\int \bar{F} dt = \Delta \bar{p} = \bar{p}_f - \bar{p}_i$$

$$\overline{F} \Delta t = \Delta \overline{p}$$

$$\overline{F} = \frac{\Delta \overline{p}}{\Delta t} = \frac{\Delta(m\overline{v})}{\Delta t}$$

$$\overline{F} = m \frac{\Delta v}{\Delta t} \quad (\text{for constant mass})$$

$$\overline{F} = m \overline{a} \quad \text{Newton's second law}$$

## Tennis Ball Impulse

- Three values for force on whiteboard:
    - Theoretical value
    - Measured + calculated from photogate
    - Measured from force sensor
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