Chapter C3: Interactions Transfer Momentum

C3.1: Velocity

It’s ok to interchange \( dt \) and \( \Delta t \).

A note on notation: \( \equiv \neq = \).

- “\( \equiv \)” means “is defined to be.”
- “\( = \)” means is equal to.

C3.2: Interactions Transfer Momentum

- Remember: interactions always involve two objects.
- Definition of momentum: \( \vec{p} \equiv m\vec{v} \).
- Momentum-transfer principle: *Any interaction between two objects affects their motion by transferring momentum from one to the other.* This is the key idea of the section.

C3.3: Impulse and Force

- The impulse \([dp]_A\) is defined as the amount of momentum that a particular interaction \( A \) delivers to an object in a short time interval.
- If this interaction transfers momentum continuously, then we define the *rate* of this transfer as the *force*

\[
\vec{F}_A \equiv \frac{[dp]_A}{dt}.
\] (1)
• The unit of Force is the Newton:

\[ 1 \text{N} \equiv \frac{\text{kg m}}{\text{s}^2} . \]  

\[ (2) \]

• Multiple impulses add:

\[ d\vec{p} = [d\vec{p}]_A + [d\vec{p}]_B + \cdots . \]  

\[ (3) \]

C3.4: Mass and Weight

• Mass is an object’s resistance to changes in its motion

• It is defined operationally in the book; we’ll do this in lab.

• Weight is different than mass. Weight is the force exerted on an object via the gravitational interaction:

\[ \vec{F}_f = m\vec{g} , \]  

\[ (4) \]

where \( \vec{g} \) is the gravitational field vector.

C3.5: Momentum Flow and Motion

I like the figures in this chapter.

C3.6: Illegal Vector Equations

This section has some good “parental” advice.