

Chapter N3: Forces from Motion

Physics I

College of the Atlantic

N3.1: The Kinematic Chain & N3.6: Graphs of 1D Motion

Velocity is the time derivative of position. And acceleration is the time derivative of velocity:

$$v(t) = \frac{dx(t)}{dt} \text{ and } a(t) = \frac{dv(t)}{dt}. \quad (1)$$

In English, this means that the velocity tells you how fast your position x is changing, and the acceleration tells you how fast your velocity is changing.

You should understand this relationship well enough to be able to make qualitatively correct graphs.

Example: For the following scenario, sketch separate plots of x , v , and a vs. t .

- I was driving fast and then I saw a police car and quickly slowed down.

N3.2: Net Force Diagrams & N3.3: Examples

To make a free body diagram, simply make a diagram of all the forces acting on a single object. The net force diagram is then obtained by rearranging the force arrows so that it's clear how the forces add together.

Examples:

1. A 3kg object hangs from a string.
2. A car accelerates along a straight, smooth road.

N3.5: Third-Law Pairs

- Pairs of forces linked by Newton's third law *always* act on different objects.
- When two forces acting on the *same* object are equal and opposite because the object is at rest, this is a result of the second law, not the third.
- See the discussion of this on p. 46.