

With friction but  
at constant velocity  
or not moving

net force

$$\sum F_x = 0$$

$$\sum F_y = 0$$

$$\sum F_x = F_{Px} - F_f = 0$$

$$F_{Px} = F_f$$

$$F_P \cos \theta = F_f$$

$$\sum F_y = F_{Py} + F_N - F_g = 0$$

$$F_P \sin \theta + F_N - F_g = 0$$

- Create a model for BFM and IFM.
  - Properties
  - Representations (graphical, mathematical, diagrammatic)
  - Rules of Behavior

## BFM

- Properties
  - Force
  - Mass
- Representations
  - Graphical  $\rightarrow$  n/a
  - Mathematical  $\rightarrow \sum \vec{F} = \emptyset$
  - Diagrammatic  $\rightarrow$  Free-Body Diagram  
Force Diagram
- Rules of Behavior
  - Happens when object is at rest or in constant velocity.
  - If forces are at an angle, must break forces into perpendicular axes.
  - (N3L) Forces come in pairs.

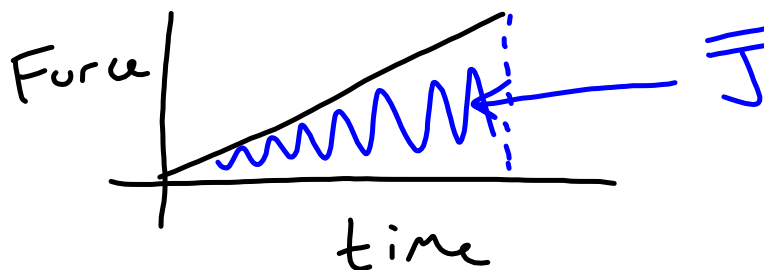
# IFM

## • Properties

- Force
- time
- mass
- velocity
- Impulse
- momentum

## • Representations

- Graphical → Force vs. time



- Mathematical →

$$\bar{J} = \int \bar{F} dt$$

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

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

$$\bar{J} = \Delta\bar{p}$$

$$\Delta p = \Delta(m\bar{v})$$