Physics 131: General Physics I
Chapter 5, part 1
February 23, 2026

5 Applying Newton's Laws

5.1 Equilibrium

Equilibrium $\implies \vec{a} = 0$.

If $\vec{v}$ also $= 0$, we call it *static* equilibrium. If $\vec{v} \neq 0$, we call it *dynamic* equilibrium.

In any case

$$\sum \vec{F} = m\vec{a} = 0 \text{ in Equilibrium}$$

This means two sets of equations:

$$\sum F_x = 0 \qquad\qquad \sum F_y = 0$$

This is best illustrated through examples.

5.2 Dynamics and Newton's Second Law

Consider the case when $\vec{a} \neq 0$. The basic idea is still:

$$\sum \vec{F} = m\vec{a}$$

In Chapter 5, we will apply Newton's Laws to a variety of situations. We will consider a variety of forces as well as a variety of accelerations. In all cases, we will employ a similar strategy:

1. Draw a neat diagram.
2. Isolate the object of interest.
3. Draw a free body diagram showing *all* the forces acting on the object.
4. Choose convenient coordinates and draw them on the diagram.
5. Write $\sum \vec{F} = m\vec{a}$ in component form.
6. Solve.
7. Check if the results are reasonable.

Again, this is best illustrated through examples.