# Static Equilibrium

- Good news: no new physics
  - Observe something isn't moving, immediately know: $\Sigma \vec{F} = 0$ $\Sigma \vec{\tau} = 0$
- Bad news: complicated setups, lots of algebra

# Setting up Problems

- Draw all forces on object, locations of force important
  - Pretend gravitational force exactly at center of mass
- 2D problems:

$$\Sigma F_x = 0$$
$$\Sigma F_y = 0$$
$$\Sigma \tau = 0$$

Technically z component of torque use $\tau = r F \sin\theta$, choose + sign if ccw, - sign if cw

# Problem Advice

- Most static equilibrium problems will require setting up forces in x, y and net torque = 0 to solve
  - Rest is algebra, but lots of equations
- Object doesn't move—*any* axis has zero net torque!
  - Choose an axis so that it has forces at that point that you don't care about
- Useful for finding torque with weird angles: $\sin(90+\theta) = \cos(\theta)$