PHYS 210 - General Physics I

FORCES

- Forces!
- Newton's Laws of Motion

Base Groups!

- BGDG: If you could have a superpower, what would it be and why?
- BGWS
- RQ

Newton's Laws of Motion

Know these by heart!

1. If $\vec{F}_{NET} = 0$, then $\vec{v} = \text{constant}$
   - Mass is a measure of inertia
2. $\vec{F}_{NET} = m\vec{a}$
   - The SI unit of force is the Newton [N]

The "net force" is the vectorsum total of ALL forces!

3. $\vec{F}_{12} = -\vec{F}_{21}$

Modeling Lab 03

$$\vec{F}_{net} = m\,\vec{a}$$

$$F_{NET,x} = ma_x$$

$$ma = mg\sin\theta - F_k$$

$$F_{NET,y} = ma_y$$

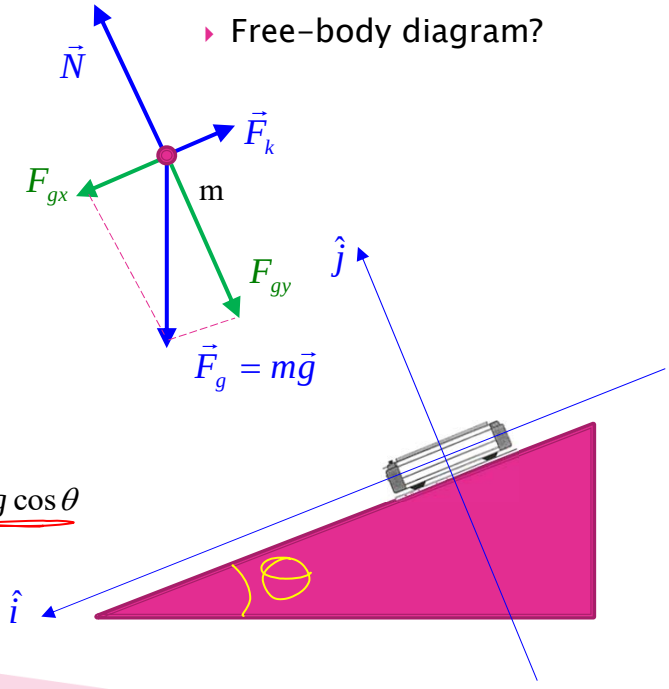
$$0 = N - mg\cos\theta$$

$$N = mg\cos\theta$$

$$\rightarrow ma = mg\sin\theta - \mu_k N = mg\sin\theta - \mu_k mg\cos\theta$$

$$\therefore \mu_k = (mg\sin\theta - ma)/mg\cos\theta$$

- Free-body diagram?



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Important caveats:

- Be clear in your mind what body (mass) you are interested in!
- Newton's Laws are only valid in inertial reference frames!
  - Can not use in an accelerated reference frame
- The superposition principle holds!
  - The vector addition of all forces on a mass gives the net force on that mass
  - When dealing with forces always draw a free-body diagram!

Newton's Laws of Motion

Note that Newton's Second Law is a *VECTOR* equation:

$$\vec{F}_{NET} = m\vec{a} = \begin{cases} F_{NET,x} = ma_x \\ F_{NET,y} = ma_y \\ F_{NET,z} = ma_z \end{cases}$$

∀ Cartesian coordinate systems you care to define!