Physics 121: Week 5 summary

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Newton's Laws

1. Inertia law
   - $\vec{v}$ is constant unless a foce acts upon it
2. Net force law
   - The sum of the forces on a body = $\frac{d\vec{p}}{dt}$
   - if the Δm = 0, $\frac{d\vec{p}}{dt}$
3. Equal and opposite forces law
   - The absolute value of $\vec{F}_{BA}$ = the absolute value of $\vec{F}_{AB}$

1 Contact and non-contact forces

Contact forces
- Normal ($\perp$)
- Friction ($\parallel$)
- Tension
- Air resistance
- Springs

Non-contact forces
- Gravitational
- Magnetism
- Weak
- Strong
- Electric

2 Free body diagrams

1. Draw a free body diagram
2. Write out the givens and the coordinate system
3. Find the sum of the forces, set them equal to ma

Example of a person walking:

- m = 60kg
- a = $1.0 m/s^2$

1. What is the magnitude of the frictional force?
2. What is the magnitude of the normal force?

1. $\sum F = ma$, $F_{GP} = ma = 60kg \cdot \frac{m}{s^2} = 60N$
    - In this case, F_{GP} is the force of the ground on the person
2. $\sum F = ma_y = 0$
    - $N_{GP} - W_{EP} = 0$
    - N_{GP} = the normal force of the ground on the person
    - W_{EP} = the weight (gravitational force) of the earth on the person
    - N = W = mg
    - N = (60kg)$(9.8\frac{m}{s^2})$N $\approx$ 600N