PHYS211
Exam 1 Prep

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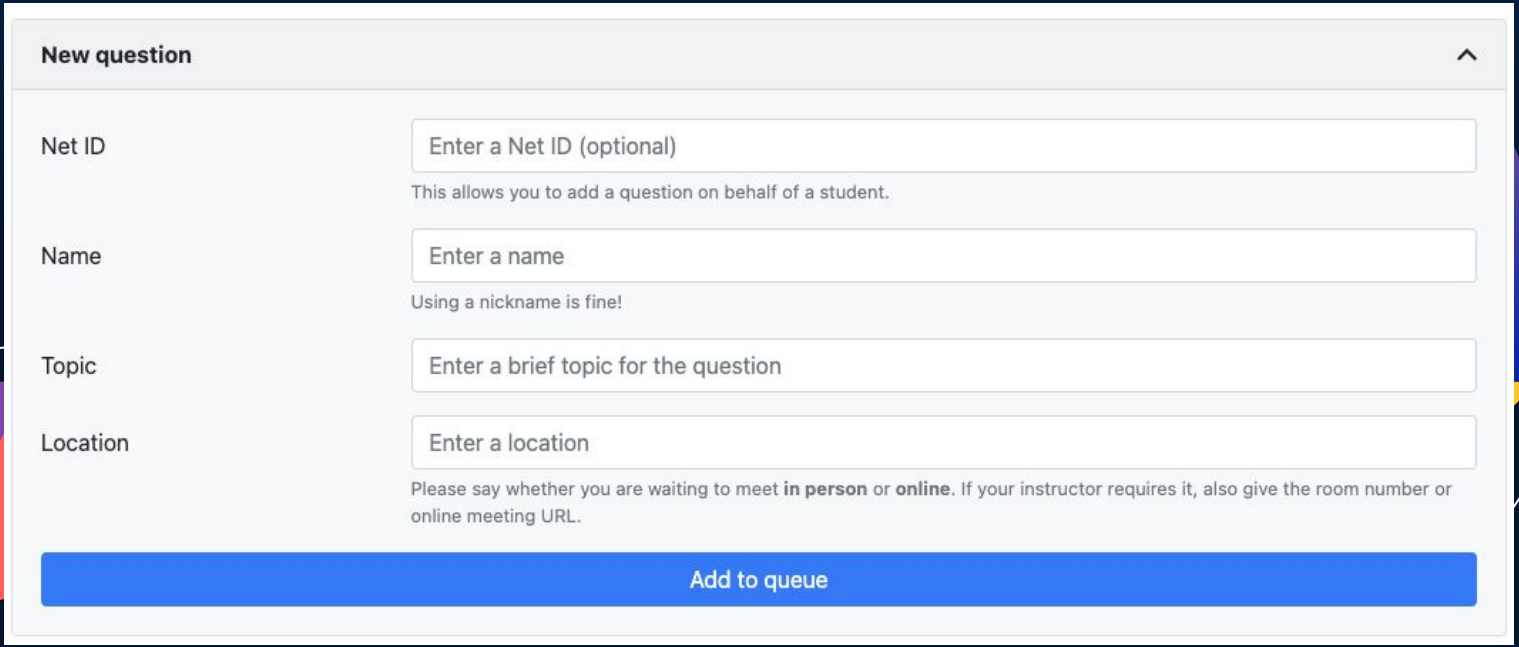
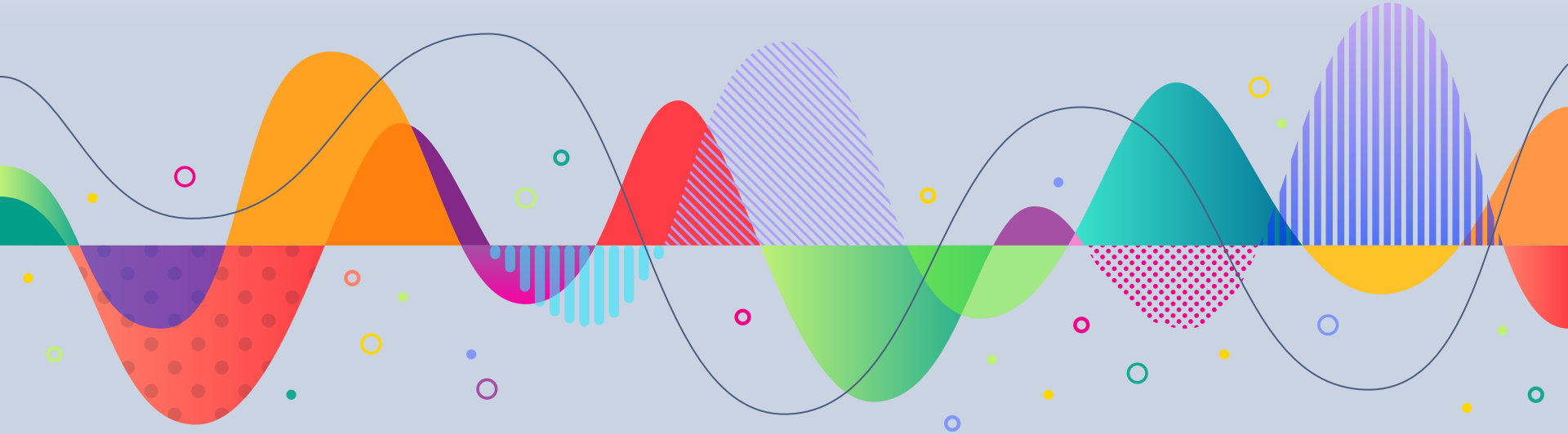
CARE / CARE PHYS 211 Exam Review



1.

Overview

Quick bits of info to know

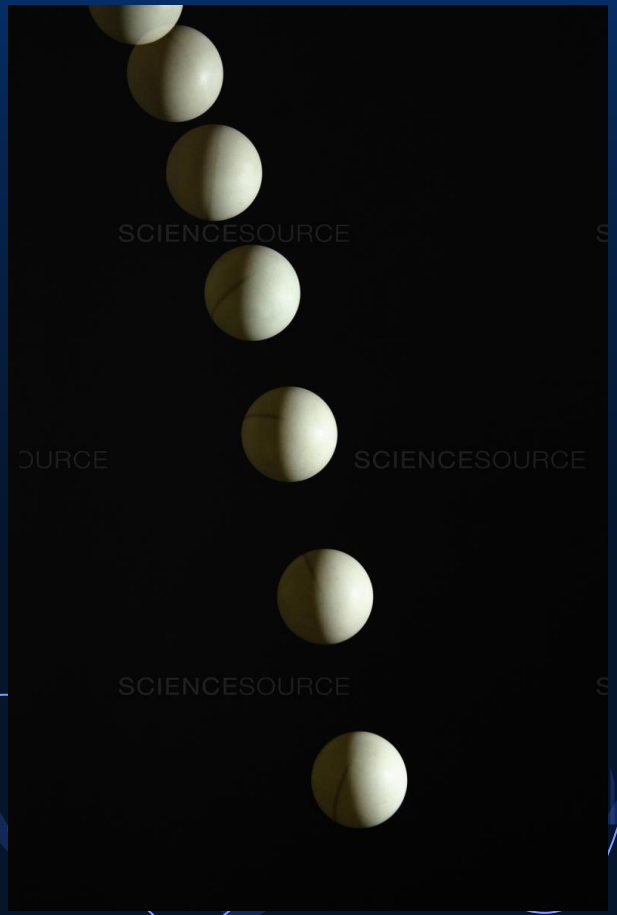


Newton's Laws

- 1st Law: Velocity of an object is constant if the sum of forces on the object is zero, **$F=0 \Leftrightarrow dv/dt=0 \Leftrightarrow a=0$** (Inertia)
- 2nd Law: The net force on an object is equal to its mass times its acceleration, **$F=ma$**
- 3rd Law: Any forces acting on an object will have an equal and opposite reaction, **$F_{a,b} = -F_{b,a}$**
- These equations are true for all interactions in Phys 211! Note that the forces and acceleration are vectors; direction matters

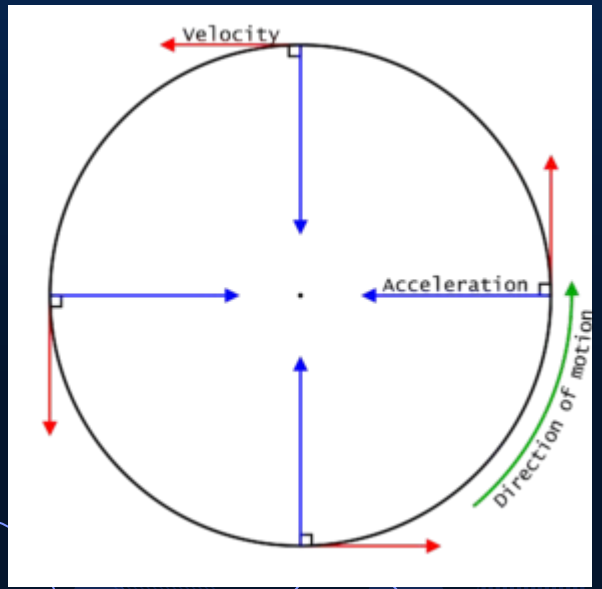
1-D, 2-D Kinematics

- Equations associated with Kinematics:
  - $v = v_o + at$
  - $r = r_o + v_o t + \frac{1}{2} a t^2$
    - r is the position in x or y (at time t)
  - $v^2 = v_o^2 + 2a(x - x_o)$



Relative, Circular Motion

- The Centripetal force is a fictitious force, meaning that it is a result of other forces acting on a system to make it go in circular motion
- Centripetal acceleration, for circular motion, is always radially inwards and the velocity is tangential to the path



Kinematics

- Projectile Motion
  - X direction: v is constant, **a = 0**
  - Y direction: v at top = 0, **a = g**
  - Remember, time is the same in both x/y
  - Break up velocity into components if needed
- Circular Motion
  - Acceleration always points inward
  - **$v = \omega r$** (and is tangential to path)
  - Direction of individual forces can be different at different positions of the circle

Forces

- Conservative
  - Weight (gravity)
  - Spring Force: $\mathbf{F_s = -k\,\Delta x}$
  - Potential Energy difference
- Nonconservative
  - Normal: Perpendicular to an object's surface by below surface
  - Tension: points away from object
  - Friction: $\mathbf{f = \mu N}$, opposes motion
- Equal & Opposite Forces
- X and Y components still apply, especially for ramp problems
- Free Body Diagrams:
  - The net force is NOT drawn on the free body diagram
  - Only draw external forces acting on the object

Friction

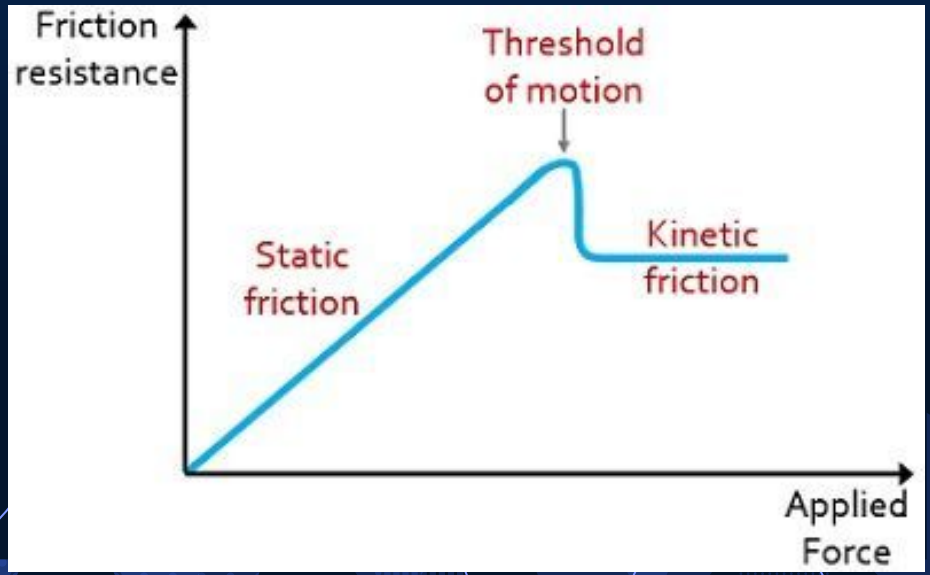
☆ Friction is a force that opposes the direction of motion

Kinetic Friction:

$$f_k = \mu_k N$$

Static Friction:

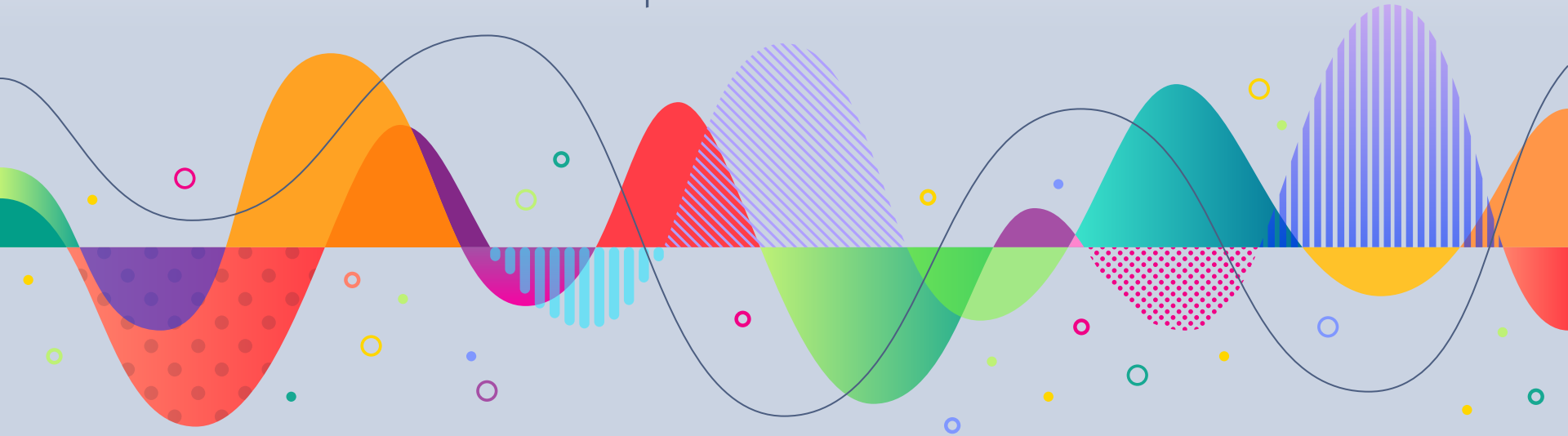
$$f_s \leq \mu_s N$$



2.

Problem Solving

Some Steps to Follow If You're Lost



Kinematics

How to Identify:

- Projectile Motion
- Given x/v/a
- Relative Motion

Kinematics

- List given variables
  - In both x and y directions
- Match up to kinematics equations on equation sheet
- Remember to watch out for Relative Motion

Forces

How to Identify:

- Springs
- Mass Sliding
- Ramps
- Strings

Forces

- ALWAYS start with Free Body Diagrams
- Write **F=ma** equations
  - In both x and y directions
  - Pay close attention to the SIGNS of your variables!
- Solve for the unknown variable(s) in the problem

Worksheet Time!

Enter Queue with your name and net ID:

By entering the queue, you help us:

-Reserve a big enough space at the next review session

-Assign enough tutors for everyone to have access to help

Thank you!