

PHYS211

Exam 1 Prep

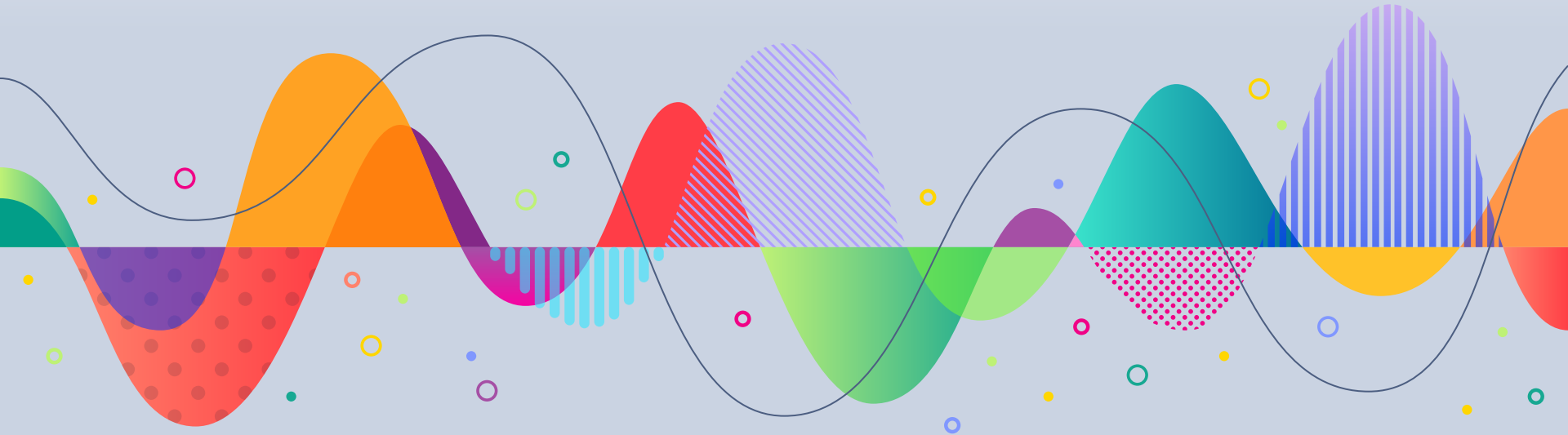


SCAN ME

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



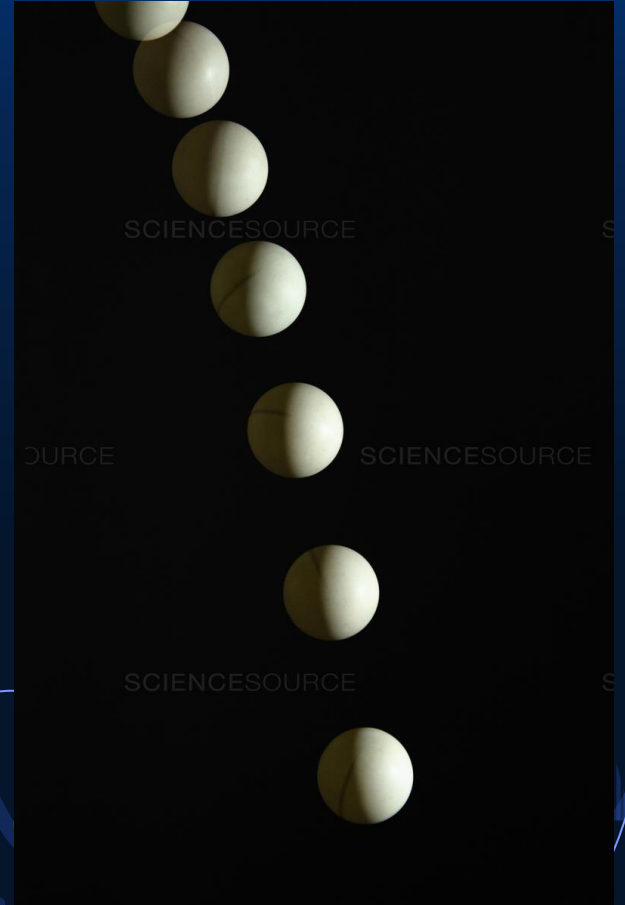
▷ Equations associated with Kinematics:

▶ $v = v_0 + at$

▶ $r = r_0 + v_0 t + \frac{1}{2} a t^2$

■ r is the position in x or y (at time t)

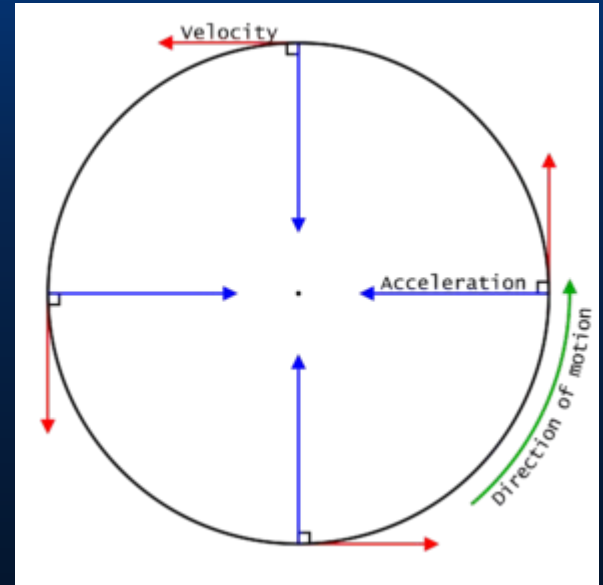
▶ $v^2 = v_0^2 + 2 a (x - x_0)$



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: $F_s = -k \Delta x$
 - ▶ Potential Energy diff
- ▷ 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
- ▷ Nonconservative
 - ▶ Normal: Perpendicular to an object's surface by below surface
 - ▶ Tension: points away from object
 - ▶ Friction: $f = \mu N$, opposes motion

Friction



- ▷ Friction is a force that opposes the direction of motion

Kinetic Friction

$$f_k = \mu_k N$$

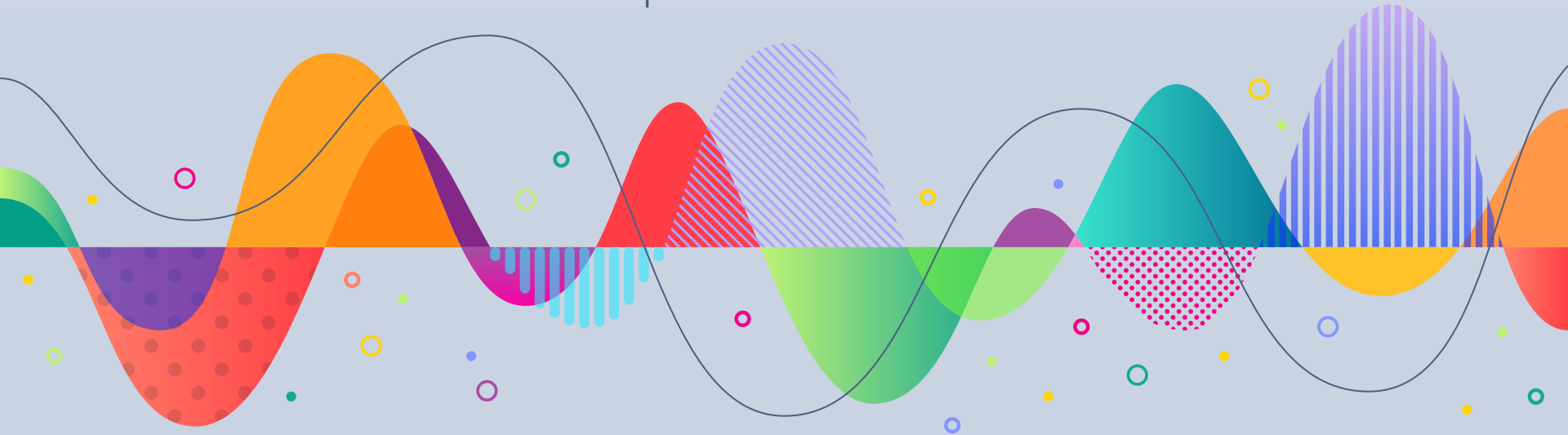
Static Friction

$$f_s \leq \mu_s N$$

2.

Problem Solving

Some Steps to Follow If You're Lost

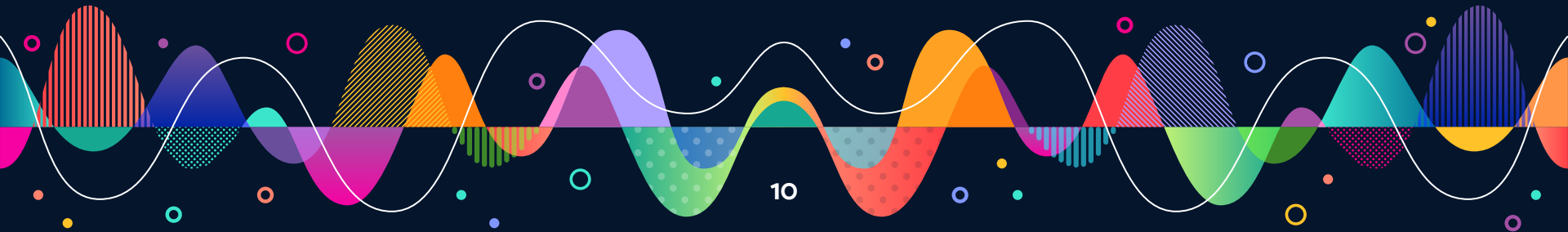


Kinematics



How to Identify:

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



Kinematics



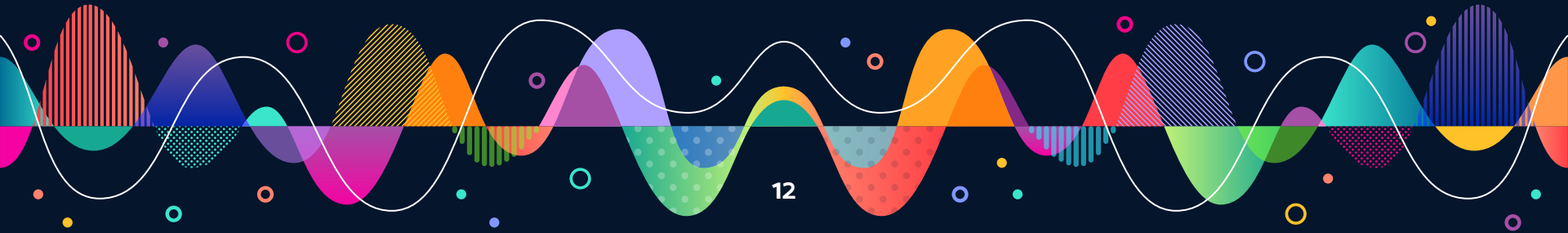
- ▷ List given variables
 - ▶ In both x and y directions
- ▷ Match up to kinematics equations on equation sheet
- ▷ Remember to watch out for Relative Motion

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!

