

## Physics 123 - Study guide for exam 2

Dr Colton, Winter 2026

- Math stuff
  - Complex numbers – polar and rectangular form in the complex plane; how/why they are useful for representing waves
  - Fourier series – what they are, why they are useful; how to calculate whether they are periodic in time or in space.
- Waves & Sound
  - Basic wave properties – amplitude, wave number, angular frequency, phase, speed
  - Waves on a string – power, velocity, reflection and transmission amplitude & power coefficients
  - Velocities of waves in other types of media—elastic waves in solids, sound in air
  - Sound
    - Decibels
    - Doppler effect (also Doppler effect for light)
    - Sonic booms
  - Standing waves – on a string, or in air
    - The standing wave equations aren't on the equation sheet! Know how to figure out the relationship between frequencies, lengths, and velocities of closed-closed, open-open, and open-closed configurations.
  - Resonance
  - Beats
  - Music
    - Standing waves in musical instruments
    - Frequency representation of sound waves (and relationship with tone quality)
    - Why you get multiples of the fundamental harmonic from pitched instruments
    - “Just ratios” vs “equal temperament” in instruments in scales—why are there two fundamentally different ways of defining notes & intervals?
      - How/why these differences lead to beats
  - Dispersion – what it is, why it arises, effects that it causes
  - Phase vs group velocities of traveling waves—what they mean, how to calculate