Final Exam Description

The final exam will be on Wednesday May 26, from 5:10 to 7:40 pm. As noted in a separate announcement, the final exam is optional:

- If you choose not to take the final, I will take your test average (after having dropped the lowest test), and that will be your grade for the final.
- If you do choose to take the final, it can only increase your grade: that is, if your score is lower than your test average, then I will revert to the score above. If your score is higher than your test average, the final will count as described in the syllabus (15% of your total grade).

Logistically, the final will work the same was as all of the other tests. There is a new Zoom link for the exam on the course homepage (or in the Zoom tab). Sign into that link using your phone and set up your phone as usual so that the surface of your desk is visible. The final exam will become available via Proctorio at 5:10 pm. As usual, you will upload your work on GradeScope at the end of the exam: please do this by 7:55 pm.

Since the exam is a long one, you may take a 5 minute break to use the bathroom whenever you wish during the exam. Please leave your phone running during this time.

During the exam you may use six one-sided sheets of notes (for example, you could use your five sheets from tests 1-5, plus an additional sheet). An equation sheet will be provided for you with the final. You may also use a calculator as usual. Be sure to bring plenty of paper to write on.

The final is sort of a "greatest hits" of the content for the course. A good place to start studying would be to redo the sample tests and actual tests (all available in Files/Tests). After that, I'd recommend identifying areas of weakness and focusing on those as you study. There is no sample final available, as between the above tests, you already have a lot to work with.

You should know:

- The meanings of the metric prefixes n, μ, m, c, k, and M.
- The definitions and relationships between position, displacement, distance, velocity, speed, and acceleration in 1D.
- How to calculate instantaneous and average velocities off an x vs. t graph and accelerations off a v vs. t graph.
- How x vs. t and v vs. t graphs correspond to actual motion, and what graphs of constant acceleration and constant velocity motion look like.
- How to solve 1D kinematics problems, including using calculus techniques and problems with multiple objects and/or time intervals.
- How to add and subtract vectors graphically.
- How to find the components of vectors.
- How to use vector components to find the magnitude and direction of vectors.
- How to solve 2D kinematics problems including, but not restricted to, projectile motion.
- Radial and tangential acceleration, and how they affect objects in motion.

- The concepts related to describing circular motion
- Newton's 3 laws of motion and how they apply to various situations. You must know which law is which.
- How to draw a free body diagram.
- How to solve Newton's second law problems including:
    - Problems involving friction.
    - Problems involving tension.
    - Problems involving multiple interacting objects.
    - Problems involving taking vector components.
    - Problems involving using tilted coordinate aces.
    - Problems involving circular motion.

- The meaning of apparent weight.
- The shortcuts for calculating work and when to apply them.
- How to apply the work-energy theorem.
- How to find the power in various situations.
- How energy is transformed and transferred, and the role work plays in this.
- How potential energy is defined when a conservative force is present.
- How to solve conservation of energy problems.
- How impulse and momentum are related.
- How to solve 1D conservation of momentum problems including collisions and explosions.
- The relationships between energy, momentum, work, and impulse.
- MEMORIZE: how to do cross products using the right-hand rule and the a*b*sin(theta) form.
- MEMORIZE: how to use the right hand rules.
- How to find the torque acting on an object when a force is applied about an axis of rotation.
- How to solve static equilibrium problems.
- How to find angular acceleration from torque and moment of inertia.
- How to use conservation of angular momentum.
- How to consider rotation in three dimensions using vectors for torque, angular velocity, angular acceleration, and angular momentum.
- How to use conceptual ideas to compare moments of inertia.
- How to complete moment of inertia integration problems.
- How to describe simple harmonic motion mathematically.
- How to describe a wave graphically and mathematically, including understanding wavefunctions, snapshot graphs, and history graphs.
- The relationships between wave speed, the properties of the medium, frequency, wave number, and related quantities.
- The ideas underlying the formation of standing waves.
- The creation of standing waves on a string fixed on both ends and the relationships that determine the frequencies of the standing waves.