

Final Exam—Monday, 12 March 2001, 11:30—1:30

Open everything except other people. Bring class handouts, problem set solutions, midterm exams, etc.

Topics sure to be represented on the exam:

- One dimensional motion for forces that depend on position, time, and or velocity
- Potential energy diagrams—possible motions for differing total energies, positions of stable and unstable equilibrium, frequency of small oscillations
- Motion under a central force—the trajectory equation, properties of orbits under power law forces including, especially, the inverse square, apsidal angle

Pretty likely topics:

- Variable mass systems (“thrust”)—e.g., rockets and raindrops
- Coupled oscillators
- Center of mass/rotational inertia/radius of gyration—using the parallel and perpendicular axis theorems, etc.

Other things we have covered and that you should be prepared to use:

- Momentum (linear *and* angular) and energy theorems (work-energy, impulse-momentum)
- The damped and/or driven harmonic oscillator
- Vector algebra and vector analysis (div, grad, curl)
- Spherical and cylindrical coordinate systems
- Determining whether a force is conservative (using $\nabla \times \vec{F}$) and multidimensional potential energy functions
- Differential scattering cross section
- Elastic collisions and transforming to and from lab and CM frames
- The physical (or “compound”) pendulum and the “center of percussion”
- Static equilibrium of a rigid body
- Gravitational field, potential energy, and potential
- Gauss’ law for gravity

Things you should have “conversational” familiarity with:

- Fourier analysis
- Anisotropic two-dimensional harmonic oscillators and Lissajous figures
- Stress and strain
- Hydrostatic equilibrium