Key Concepts for Midterm 1

Focus on concepts, derivations, and homework problems. I do not expect you to memorize complicated formula, such as the ones in equations 1.81-1.84 or 1.99-1.101.

Chapter 1:
Basis transformation. It is useful to know how to set up the lambda transformation matrix.
Scalar product
Dot product
Differentiation of a vector
Velocity and acceleration in curvilinear coordinate systems (plane polar, cylindrical, spherical; be able to derive equations 1.97 and 1.98).
Angular velocity
Gradient, Divergence, and Curl
Directional derivative (page 40).
Gauss and Stokes theorems

Chapter 2:
Newton’s laws
Set up and solve equations of motion (both in 1D and 2D), including friction or drag
Conservation theorems
Work, kinetic energy, potential energy
Definition conservative force field
Stable and unstable equilibria.