

# INTRODUCTORY PHYSICS: STATE FRAMEWORKS

## 1. Motion and Forces

*Central Concept:* Newton's laws of motion and gravitation describe and predict the motion of most objects.

- 1.1 Compare and contrast vector quantities (e.g., displacement, velocity, acceleration force, linear momentum) and scalar quantities (e.g., distance, speed, energy, mass, work).
- 1.2 Distinguish between displacement, distance, velocity, speed, and acceleration. Solve problems involving displacement, distance, velocity, speed, and constant acceleration.
- 1.3 Create and interpret graphs of 1-dimensional motion, such as position vs. time, distance vs. time, speed vs. time, velocity vs. time, and acceleration vs. time where acceleration is constant.
- 1.4 Interpret and apply Newton's three laws of motion.
- 1.5 Use a free-body force diagram to show forces acting on a system consisting of a pair of interacting objects. For a diagram with only co-linear forces, determine the net force acting on a system and between the objects.
- 1.6 Distinguish qualitatively between static and kinetic friction, and describe their effects on the motion of objects.
- 1.7 Describe Newton's law of universal gravitation in terms of the attraction between two objects, their masses, and the distance between them.
- 1.8 Describe conceptually the forces involved in circular motion.