Study Guide for Test 1

Fundamental definitions:

$$\vec{v} = \frac{\Delta\vec{r}}{\Delta t} = \frac{\vec{r}_f - \vec{r}_i}{t_f - t_i} \qquad \text{(definition of velocity)}$$

$$\vec{a} = \frac{\Delta\vec{v}}{\Delta t} = \frac{\vec{v}_f - \vec{v}_i}{t_f - t_i} \qquad \text{(definition of acceleration)}$$

For constant acceleration only:

$$v_x(t) = v_x(0) + a_x t$$

$$x(t) = x(0) + v_x(0) \cdot t + \frac{1}{2} a_x t^2$$

(and similarly for y, z)

For a freely flying projectile, $\vec{a}$ points straight down and has magnitude $g = 9.8$ m/s^2.

For circular motion at constant speed, $\vec{a}$ points directly toward the center of the circle and has magnitude

$$|\vec{a}| = \frac{|\vec{v}|^2}{R}$$

You should be able to do the following:

- Express numerical quantities using correct units and an appropriate number of significant figures. Convert units as needed.
- Draw and interpret graphs of x, v_x, and a_x. Compute slopes and areas as necessary to determine position, displacement, velocity, and acceleration.
- Add, subtract, negate, and scalar-multiply vectors, both graphically and in terms of components.
- Compute vector components from magnitude and direction, and vice-versa.
- Draw velocity and acceleration vectors for any type of motion.
- Solve constant-acceleration problems.
- Understand and compute relative velocities.
- Solve other problems, as in the homework, covering material outlined on this page.