Exam 1
Learning Goals

Students will be able to:

Create and interpret motion diagrams

use the appropriate number of significant digits.

State the SI units and convert to these units as necessary to solve problems.

Make order-of-magnitude estimates.

Both interpret and sketch position vs. time, velocity vs. time and acceleration vs. time graphs.

Use the area under the curve of a velocity vs. time graph to find the total displacement.

Use the slope of a position vs. time graph to find velocity. Similarly, use the slope of a velocity vs. time graph to find acceleration.

define and identify position, displacement, speed, velocity, acceleration

describe and identify scalars and vectors

identify a vector, its magnitude and direction.

Use vectors to describe motion.

Use vectors with a motion diagram

Add and subtract vectors both graphically and algebraically.

Solve one-dimensional motion problems including free-fall problems using the recommended problem solving strategy of 1. Draw a picture, 2. Collect necessary information (givens), 3. Do preliminary calculations (i.e. conversions), 4. solve, and 5. assess.

Break a vector up into its components.

Combine components into one vector (magnitude and direction)

Identify the components of a vector in a rotated coordinate system.

Use a rotated coordinate system to solve a motion problem on a ramp.

Use the concept that in projectile motion, the motion consists of two pieces: 1. Vertical motion with free-fall acceleration due to gravity and 2. Horizontal motion with constant velocity $v_{xf} = v_{xi}$ because $a_x = 0$.

Solve relative motion problems using the symbolic notation described in the text and in class.

Solve two dimensional motion problems including projectile motion problems and circular motion problems using the recommended problem solving strategy of 1. Draw a picture, 2. Collect necessary information (givens), 3. Do preliminary calculations (i.e. conversions or find vector components), 4. solve, and 5. assess.

$v_x = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{\Delta t}$ $a_x = \frac{\Delta v_x}{\Delta t} = \frac{v_{xf} - v_{xi}}{\Delta t}$ $a = \frac{v^2}{r}$ $f = \frac{1}{T}$

$x_f = x_i + v_{xi}\Delta t + \frac{1}{2} a_x(\Delta t)^2$ $v_{xf} = v_{xi} + a_x\Delta t$ $v_{xf}^2 = v_{xi}^2 + 2a_x(\Delta x)$

$\sin\theta$ = opp/hyp $\cos\theta$ = adj/hyp $\tan\theta$ = opp/adj $a^2 + b^2 = c^2$