Exam 1 Review Notes

Key:
- **Category I:** most important stuff. Definitely on exam.
- **Category II:** less important, but still "fair game." *Could* be on exam.
- **Category III:** definitely *not* on exam.

Chapter 1

Category I

- Vectors (Secs 1.7 – 1.9):
  - Adding, subtrating vectors (graphically and by components)
  - Multiplying by scalars (graphically and by components)
  - Switching between magnitude/direction and component representations
- Dimensional Analysis (Sec 1.4 and *especially* in class notes)

Category II

- Unit Conversions (Sec 1.4)
- Significant Figures (Sec 1.5)

Category III

- Sec 1.1
- Sec 1.2
- Sec 1.3 (but *should* know standard units for mass, length, time and also common metric prefixes)
- Sec 1.6
- Sec 1.10

Chapter 2

Category I

- One-Dimensional Kinematics for Motion with Constant Acceleration (Sec 2.4)
  - probably more than one problem on this!
- Free-fall (Sec 2.5)… Another example of 1-D motion with constant accel
  - at least one problem on this

Category II

- Graphical Interpretations of v_{av}, v, a_{av}, a (Secs 2.1 – 2.3)
- Velocity and Position by Integration (Sec 2.6)

Category III

- (empty… i.e., there is nothing in this category… *all* of Ch. 2 could show up on the test)

Chapter 3

Category I

- Projectile motion (Sec 3.3)
  - probably more than one question on this!

Category II

- Relative velocity (Sec 3.5)
  - probably *will* show up on this test
- Finding instantaneous velocity, acceleration vectors by differentiation with respect to time (Secs 3.1, 3.2)
  - $\vec{r}(t) \equiv \langle x(t), y(t), z(t) \rangle$
  - $\vec{v}(t) \equiv \frac{d}{dt}\vec{r}(t) = \left\langle \frac{dx(t)}{dt}, \frac{dy(t)}{dt}, \frac{dz(t)}{dt} \right\rangle$
  - $\vec{a}(t) \equiv \frac{d}{dt}\vec{v}(t) = \left\langle \frac{dv_x(t)}{dt}, \frac{dv_y(t)}{dt}, \frac{dv_z(t)}{dt} \right\rangle$ or $\vec{a}(t) = \frac{d^2\vec{r}}{dt^2} = \left\langle \frac{d^2x(t)}{dt^2}, \frac{d^2y(t)}{dt^2}, \frac{d^2z(t)}{dt^2} \right\rangle$
- *Parallel and Perpendicular Components of Acceleration*, pp. 85-87
  - could show up as a conceptual question

- Sec 3.4: Motion in a Circle
  - could show up as a conceptual question
  - Uniform Circular Motion
    - $a_{\perp} = a_{rad} = \frac{v^2}{r}$
    - $a_{\parallel} = 0$ … speed not changing
  - Non-uniform Circular Motion
    - still have perpendicular (radial) component of accel: $a_{\perp} = a_{rad} = \frac{v^2}{r}$
    - speed changing so there *is* some tangential component of acceleration: $a_{\parallel} = \frac{d|\vec{v}|}{dt}$

Category III

- (empty… i.e., there is nothing in this category… *all* of Ch. 3 could show up on the test)

Chapter 4

Category I

- Newton's Second Law (Sec 4.3)
  - definitely more than one problem on this! (It's the most important thing in the whole *course*, after all!)
  - you should be able to handle problems in which the forces are all along the coordinate axes *and* the more complicated problems in which some forces point at some angle relative to one of the coordinate axes, so that you have to resolve the forces into *x* and *y* components.
    - an example (*very* likely to show up on the exam) of this second type is a problem involving something on a *ramp*.
- Free-body diagrams (Sec 4.6)
  - will show up in the context of a problem on Newton's 2nd law… i.e., you'll have to know how to draw the FBD to solve the problem
- Mass and Weight (Sec 4.4)
  - just need to know $w = mg$ … will show up in problems on the 2nd law

Category II

- Newton's 3rd Law (Sec 4.5)
  - could be something conceptual on this… similar to some of your MasteringPhysics questions on the 3rd law
- Newton's 1st Law (Sec 4.2)

Category III

- Sec 4.1: Forces and Interactions