Physics 50 Lecture Final Review

1. ***MOTION IN 1-D***
   a) Understand the terms and concepts required to describe the motion of a particle moving in one dimension.
   b) Know how to use and derive the kinematic equations to describe the motion of an object moving with constant acceleration
   c) Know how to use the graphs of x vs. t, v vs. t , and a vs. t to find the position, velocity, and acceleration of a particle moving with constant or non-constant acceleration.
   d) Know how to calculate the displacement and velocity using the area interpretation.
   e) Know how to apply the kinematic equations to object in free-fall motion.
   f) Understand and know how to define the following terms:
      - Position
      - Displacement
      - Average velocity
      - Instantaneous velocity
      - Average speed
      - Average acceleration
      - Instantaneous acceleration
      - Free-fall Motion
      - Acceleration of gravity

2. ***VECTORS***
   a) What is a vector quantity?
   b) What is a scalar quantity?
   c) Why are vectors important?
   d) Know how to add vectors graphically (geometrically) and using component method.
   e) What are unit vectors? What are they used for?
   f) Know how to calculate displacement, velocity (average), and acceleration (average) vectors.
   g) How do you draw the velocity vector given the path of the particle?
   h) Vector properties (equality of vectors, commutative law, associative law, vector subtraction, negative of a vector, scalar multiplication)
   i) Scalar component of a vector.
   j) Vector components of a vector.
   k) Magnitude and direction of a vector.
   l) Know how to sketch vectors graphically.
   m) Know how to apply the kinematic equations in component form.

3. ***MOTION IN 2-D***
   a) Motion in 2D can be analyzed by treating the x and y motion separately. The two motions are independent, each with constant acceleration.
   b) Kinematic equations can be used to describe motion in 2-D since it's motion with constant acceleration.
   c) Calculate the maximum height of a projectile.
   d) Calculate the range of a projectile.
   e) What is the maximum range of a projectile?
   f) What is the path(trajectory) of a projectile moving in 2-D?
   g) What are the acceleration components?
   h) What is an inertial reference frames?

i) What is uniform circular motion (UCM)?
j) What is the magnitude and direction of the acceleration of a particle moving in UCM?
k) What equations can you use to calculate radial (centripetal) acceleration?
l) Why does a particle moving un UCM have acceleration?
m) What is the circumference of a circle?

4. ***NEWTON'S LAWS OF MOTION (VERY IMPORTANT!!!!!!)***

a) How many Newton's Laws are there? (really?)
b) Make sure you're able to write down Newton's laws of motion and be able to explain conceptually and practically each one of them.
c) Know how to apply Newton's Laws of Motion to describe the motion of a system in equilibrium or moving with constant acceleration. See "STEPS IN USING NEWTON'S LAWS OF MOTION" on notes on homepage.
d) ALWAYS define your system when applying Newton's Laws.
e) Define a convenient SYSTEM and use a convenient coordinate system to apply Newton's Laws.
f) ALWAYS draw a FREE-BODY diagram when applying Newton's Laws making sure to include ALL external forces acting on system !!!!!
g) Newton's Laws fail when applied to particles moving near the speed of light and when applied to the subatomic scale.
h) What is an inertial reference frame?
i) What are the 4 fundamental forces of nature?
j) Give examples of different types of forces.
k) Know how to apply Newton's Laws to a system moving in Uniform Circular Motion.
l) Kinetic and static frictional forces.
m) Coefficients of friction.
n) What is the maximum value of static frictional force? How can you calculate it?
o) Is there a maximum value of kinetic frictional force?
p) Understand and know how to define the following terms:

- Equilibrium
- Conditions for equilibrium
- Net (resultant) force
- External forces
- Internal forces
- System
- Free-Body Diagram
- Mass
- Inertia
- Weight
- Apparent weight
- Action-reaction force
- Non-inertial reference frames

5. ***WORK***

a) Know the definition of the scalar (dot) product.
b) Know how to compute the scalar product.
c) Definition of work $W = \vec{F} \bullet \vec{s}$
d) Work is a scalar quantity NOT a vector quantity.
e) What is the physical interpretation of work?

f) Know how to compute the work done by a constant and non-constanr force.
g) Know how to compute work graphically using the graph of F vs. x.
h) How do you compute the net work on a system?
i) What does negative work mean?
j) What is the work done by the spring force?
k) Know what kinetic energy is and how to compute it.
l) Understand the meaning and how to use the Work-KE Theorem.
m) What are the steps we outlined in class to apply the W-KE Theorem?
n) Why is the W-KE Theorem important?
o) Work is measure of transferring energy into/out of a system due to a force doing work on system.
p) What is the spring force equation?
q) What is the physical meaning of the spring constant?
r) What is the physical meaning of the negative sign in the spring force equation?
s) What is the work done by the spring force for a giving displacement?