

Name: \_\_\_\_\_

## LAB 4 PRE-LAB

Complete this pre-lab before lab and bring it with you to lab. Your **instructor must approve** all parts of the pre-lab **before you begin** any lab activities.

1. Read the activities. Note the measurements and observations to be taken in each activity. Make a paper data sheet to record the data. It should have spaces for all the data you will record in Activity 1 and Activity 2. Bring your data sheet to lab for use.
2. For an object in free fall from an initial height  $h$  and an initial speed of zero,
  - a. Find the kinematic equation for the height  $y$  as a function of time  $t$ . For simplicity, make the ground's height equal to zero.

$$y =$$

- b. Solve the equation for time to land (find  $t$  when  $y = 0$ ).

$$t =$$

3. The horizontal component of velocity  $v_x$  of any projectile affected only by gravity is constant.
  - a. Find the kinematic equation for  $x$ , the horizontal component of its position, at time  $t$ .

$$x =$$

- b. Solve the equation for  $v_x$  in terms of  $x$  and  $t$ .

$$v_x =$$

4. For a ballistic object launched with speed  $v_0$  at angle  $\alpha$  above horizontal from a height  $h$ :
  - a. Find the formulas for  $v_{0x}$ , the horizontal component of initial velocity, and  $v_{0y}$ , the vertical component of initial velocity, from  $v_0$  and  $\alpha$ .

$$v_{0x} =$$

$$v_{0y} =$$

- b. Find the formula for height  $y$  as a function of launch height  $h$ ,  $v_{0y}$ , and time  $t$ .

$$y =$$

- c. Solve the equation for time to land (find  $t$  when  $y = 0$ ).

$$t =$$