PHYSICS 121 WORKSHEET 4 9/11/2017

NAME: SECTION:

1. A projectile is launched from the origin at an angle θ from the x-axis. The magnitude of its initial velocity is v_0. Sketch the motion with a coordinate system and labels. Indicate the given information and label the apex (maximum height) H and range R. Then answer the following questions in terms of v_0, θ, and g.

i) What are the x and y components of the velocity when the projectile reaches the apex H? How much time t_H is required to reach this point?

ii) What is the x-coordinate of the apex point (x, H)?

iii) What is the maximum range of the projectile R? How much time t_R is required to reach this point?

iv) What is the ratio t_H/t_R? Does this make sense physically?

2. Consider the scenario from **1.**, but now let the projectile be launched from the point $(x_0, y_0) > (0, 0)$. Sketch the new scenario and answer **i)-iii)** from **1.** in terms of x_0, y_0, v_0, θ, and g.

3. In Section 3.7, you find that the motion of a projectile launched from the origin is parabolic in the y-coordinate. You do this by starting from $x = v_{x0}t$ and substituting $t = x/v_{x0}$ into $y = v_{y0}t - \frac{1}{2}gt^2$, obtaining a solution of the form $y = Ax - Bx^2$.

i) What are A and B? Write your answer in terms of v_{x0}, v_{y0}, and g.

ii) If we do not assume the projectile is launched from the origin, i.e if $(x_0, y_0) \neq (0, 0)$, what are the new values of A and B? Answer in terms of x_0, y_0, v_{x0}, v_{y0}, and g.