Name: _____ **Panther ID:** _____

Worksheet - Nov. 28 MAT 3501 Fall 2017

1. On planet X, the gravitational acceleration is a m/s^2. An x-ling sits on the top of a sky-scraper on planet X at a height y_0 from the surface of the planet.

(a) The x-ling shoots straight up an arrow with an initial speed of v_0 m/s. Find an equation for the height $y(t)$ of the arrow t seconds after it was shot. Assume no friction. If you prefer numbers, assume $y_0 = 800$ meters, $v_0 = 32$ m/s, $a = 20$ m/s^2.

(b) The same x-ling shoots now a second arrow with the same initial speed of v_0 m/s, but now making an angle α with the horizontal. Find now parametric equations $(x(t), y(t))$ to describe the trajectory of this arrow, where t is the time in seconds since the arrow was shot. Again, assume no friction. If you prefer numbers, take y_0, v_0, a as in part (a) and $\alpha = 60°$.

2. A plane traveling horizontally at 80 m/s over flat ground (on Earth!) at an elevation of 3000 m releases an emergency packet.

(a) Assuming there is no air friction, describe the motion of the package by parametric equations $(x(t), y(t))$, where t is the time in seconds since the package was released. What is the trajectory of the package? Explain how you chose the coordinate system. Use $g = 9.8$ m/s^2 for the gravitational acceleration.

(b) When does the package hit the ground and what are the coordinates of the point of impact?

(c) Find the angle at which the released package hits the ground.

3. Earlier today, at the Golf Classic Open, Greg Normal hit a chip shot from the rough that just skimmed the top of a 90 foot pine tree and went right into the hole, 220 ft away, for an eagle. Assume the base of the tree is 110 ft from where the ball was in the rough, thus, half-way between the ball and the hole.

(a) Choose a suitable coordinate system and write an equation for the path of the ball.

(b) What is the angle at which the ball takes off?

(c)* Find the time the ball was in the air. (Hint: the gravitational acceleration is $g = 32$ ft/s^2.)

(d)** Find the initial speed of the ball.