Tuesday's Parametric Review:

What could be on the parametric retest/final exam?

> Possible values of t (so possible values of x and y)
> Eliminating a parameter
> Writing parametric equations of lines, conics and non-functions
> Finding intercepts, asymptotes, distances, slopes, maximums, minimums, intersections, transformations
> Applications like projectile motion and circular motion.

Example question:

A ball is launched with initial velocity of 75' at a 42° angle from a height of 4'.

1) How long will the ball be in the air?

2) What height will it reach?

3) How far will it travel before hitting the ground?

4) If there is a monkey in a tree 80' from where the ball is being launched at a height of 20', how close will the ball come to hitting the monkey?

Answers:

Parametric equations of the ball are;

$x = (75\cos 42°)t$ and $y = (75\sin 42°)t – 16t^2 + 4$

1. The ball will be in the air until it touches ground and that is a height or y concept, so we will set y = 0 and solve for t. If $(75\sin 42°)t – 16t^2 + 4 = 0$, then, by using QUADFORM, t = 3.214... and -0.7778. Clearly the negative number is impossible, so **t = 3.214 seconds**.

2. The maximum height is a y value, so we need the maximum value of the $y = (75\sin 42°)t – 16t^2 + 4$ which can be found when t = -b/(2a) = -75sin42°/(-32) = 1.568…. and y, when evaluated at 1.568…, is **43.35 feet**.

3. Find the x value at t = 3.214 seconds. **d = 179.15 feet**

4. $d = \sqrt{(\Delta x)^2 + (\Delta y)^2} = \sqrt{(75\cos(42°)t – 80)^2 + (75\sin(42°)t – 16t^2 + 4 – 20)^2}$ Graph this as a function of x and find the minimum, which occurs at (1.394, 22.98) which means **at t = 1.394 seconds, the ball will be as close to the monkey as it will ever get and that distance is 22.98 feet apart.**