CMSC427 Fall 2017
Hw 2 – Parametric Curves

Due by start of class Tuesday, Sept. 5th
On paper or online on Canvas (your choice)

For parametric equations we'll use interchangeably the notation $x(t)$ or $f_x(t)$ or even $x = f(t)$

1. Just to work with it, given points P0 = (90,120) and P1 = (150,180), give the equations for a parametric line through both points (starts at P0, ends at P1). Also give the midpoint of the segment.

2. Given the following two parametric curves, validate that they satisfy the associated implicit equations by substitution and reduction to identity. Assume for both the range of t is (-inf,inf).

Parabola.	Implicit equation	$x^2 - 4ay = 0$
	Parametric equations	$x(t) = 2at$ $y(t) = at^2$
Hyperbola	Implicit equation	$\left(\frac{x}{a}\right)^2 - \left(\frac{y}{b}\right)^2 = 1$
	Parametric equations	$x(t) = a\sec t$ $y(t) = b\tan t$

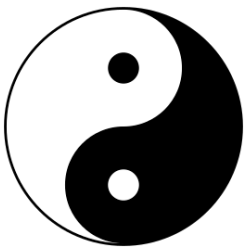
3. For the parabola in question (2), would any monotonically increasing function of t (t^2, sqrt(t), etc) be valid in the parametric equations? E.g., would the parametric equations below also be valid? (And, yes, in the equation for y(t) that's square root squared.)

Parametric equations	$x(t) = 2a\sqrt{t}$ $y(t) = a\sqrt{t}^2$

What would happen if you used non-increasing functions of t, like cos or sin?

4. Sketch the 2D implicit curve for the function $f : R^2 \rightarrow R$ where: $f(x, y) = |x| + |y| - 1$
Label the 2D coordinates as appropriate.

Does this function satisfy the inside/outside convention for implicit curves? Why? (The inside/outside convention is that the implicit function is negative inside the curve, positive outside, and zero right on the curve.)



5. The Yin Yang symbol can be drawn as a set of parametric curves. In particular, the outlines of the nested "tadpole" regions can be drawn by drawing in sequence a set of curves, and then obviously the two smaller circles are parametric circles. Assuming you're drawing the symbol centered at zero with a radius of 1, describe the curves, and in particular the ranges of t you'd need, for each part of the symbol. This can be pseudo code or English, just be precise in the curve and t.