The Astroid

Brianne Yokoyama and Lydia Silva

May 16, 2007

Our Equation

Given the Cartesian equation of

$$x^{2/3} + y^{2/3} = a^{2/3}$$

Our first task was to parameterize it.

Noticing that we have an equation similar to

$$x^2 + y^2 = r^2$$

we rewrote our equation to be something we were more familiar with:

$$(x^{1/3})^2 + (y^{1/3})^2 = (a^{1/3})^2$$

By looking back to are equation

$$x^2 + y^2 = r^2$$

we can use our old parameterization factors to switch to polar cooridinates

$$x = r * cos(\theta)$$

And

$$y = r * sin(\theta)$$

In our astroid we have

$$x^{1/3} = a^{1/3} * cos(\theta)$$

and

$$y^{1/3} = a^{1/3} * sin(\theta)$$

By cubing both sides of both equations we get our equations:

$$x = a * cos^3(\theta)$$

and

$$y = a * sin^3(\theta)$$

The Astroid

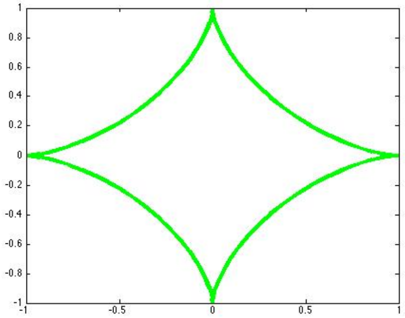

Figure: $x^{2/3} + y^{2/3} = 1$

In this figure we have our *a* set to one.

We now explore as a changes in size.

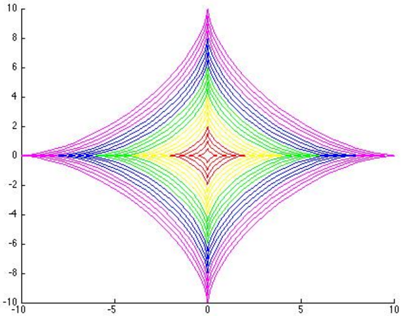

Figure: $.5 \leqslant a \leqslant 10$

We can now look at modifying the equations. By adding and subtracting of the x and y equation we can translate our equation into any place we want.

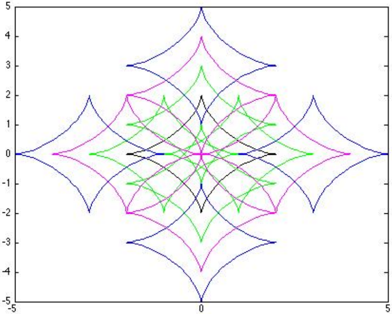

Figure: Astroid Field

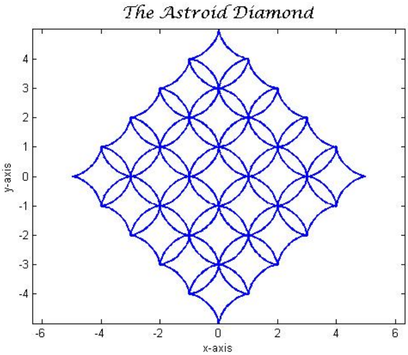

Figure: Astroid Diamond