

# PolyAnalyze

## What is PolyAnalyze?

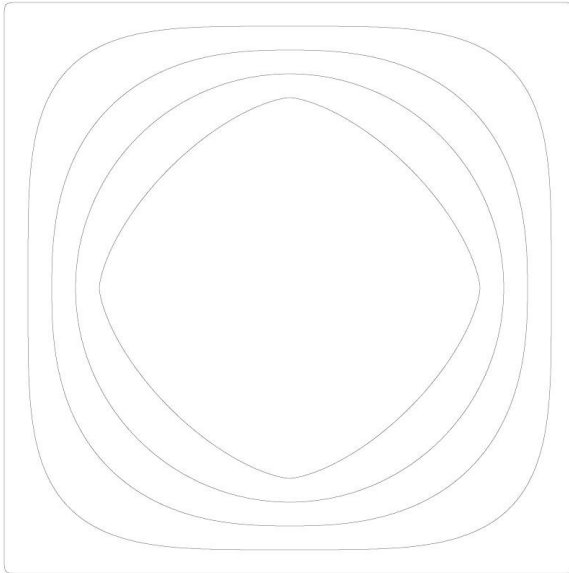
PolyAnalyze is a tool to help calculate the shape of a Poly. When used in conjunction with PolyDraw it allows you to design some unique shapes.

## What is a Poly?

Poly is short for a parametric equation having the following form.

$$\left| \frac{X}{X_{radius}} \right|^{PolyOrder} + \left| \frac{Y}{Y_{radius}} \right|^{PolyOrder} = 1$$

For the mathematically inclined you will see it defines a closed curve that is  $2 \cdot Y_{radius}$  tall and  $2 \cdot X_{radius}$  wide. The Poly Order determines its “bulkiness”(for a lack of a better term). For those not mathematically inclined, a picture is worth a thousand equations.



This figure has five curves with the following dimensions.

$X_{radius}$	$Y_{radius}$	Poly Order	$D_{radius}$
1.500"	1.500"	100	2.107"
1.375"	1.375"	4	1.6352"
1.250"	1.250"	2.5	1.3400"
1.125"	1.125"	2	1.125"
1.000"	1.000"	1.5	0.891"

In this particular example  $X_{radius}$  and  $Y_{radius}$  are the same. They do not have to be but this is not pertinent to this explanation. Note the larger the value of Poly Order the closer the curve comes to being rectangular. When the Poly Order is two, you have a circle (ellipse)

if the X and Y radii are different.) The  $D_{radius}$  is the value affected by the Poly Order as shown in the equation below.

$$X_{radius}^2 + Y_{radius}^2 = D_{radius}^4 \frac{1}{PolyOrder}$$

### Example

The goal of this example is to design a bowl that is 10” tall and 8”wide. To give the design an Asian feel you decide to set the Poly Order initially to 2.5. Each ring must have be a uniform ¼“. There are three rings and a base for four Polys in total.

#### Step 1 Enter known Poly data into a table.

$X_{radius}$	$Y_{radius}$	Poly Order	$D_{radius}$
4.0000”	5.0000”	2.500	
3.7500”	4.7500”		
3.5000”	4.5000”		
3.2500”	4.2500”		

#### Step 2 Calculate first PolyOrder

The  $D_{radius}$  for the first Poly can be calculated by running PolyAnalyze. Start PolyAnalyze, enter 4 into the X Radius cell, “5” into the Y Radius cell, and “2.5” into the Poly Order cell. Click on the D Radius solve button and you get a result of 4.8527. Enter this in the table and calculate all the other  $D_{radius}$  values.

$X_{radius}$	$Y_{radius}$	Poly Order	$D_{radius}$
4.0000”	5.0000”	2.500	4.8527”
3.7500”	4.7500”		4.6027”
3.5000”	4.5000”		4.3526”
3.2500”	4.2500”		4.1027”

#### Step 3 Calculate all remaining Poly Orders

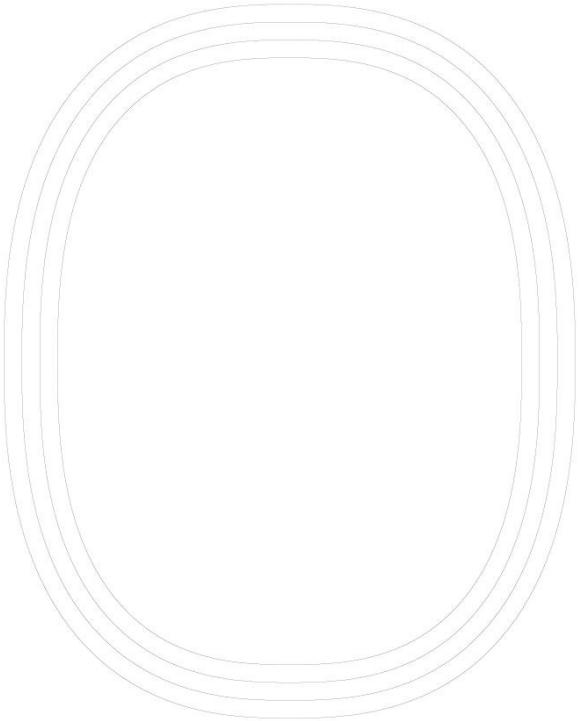
With the values for the X, Y, and D radii, use PolyAnalyze to calculate the Poly Order for each Poly.

$X_{radius}$	$Y_{radius}$	Poly Order	$D_{radius}$
4.0000”	5.0000”	2.500	4.8527”
3.7500”	4.7500”	2.532	4.6027”
3.5000”	4.5000”	2.569	4.3526”
3.2500”	4.2500”	2.611	4.1027”

PolyAnalyze can do limited math. Let it calculate the new radii values by subtracting ¼ from each of them before solving for the new Poly Order.

**Step 4 Enter Data into Poly Draw.**

Run PolyDraw and set the number of Polys to four. Enter in the X Radius, Y Radius and Poly Order for each Poly. Click the Convert button and the following design, in PDF form, is created.



Note this design is for a bowl that is 8" wide and 10" tall. The rings all have a uniform thickness of  $\frac{1}{4}$ ".

**Summary**

PolyAnalyze is a tool to help you better define the curves you need for your designs.