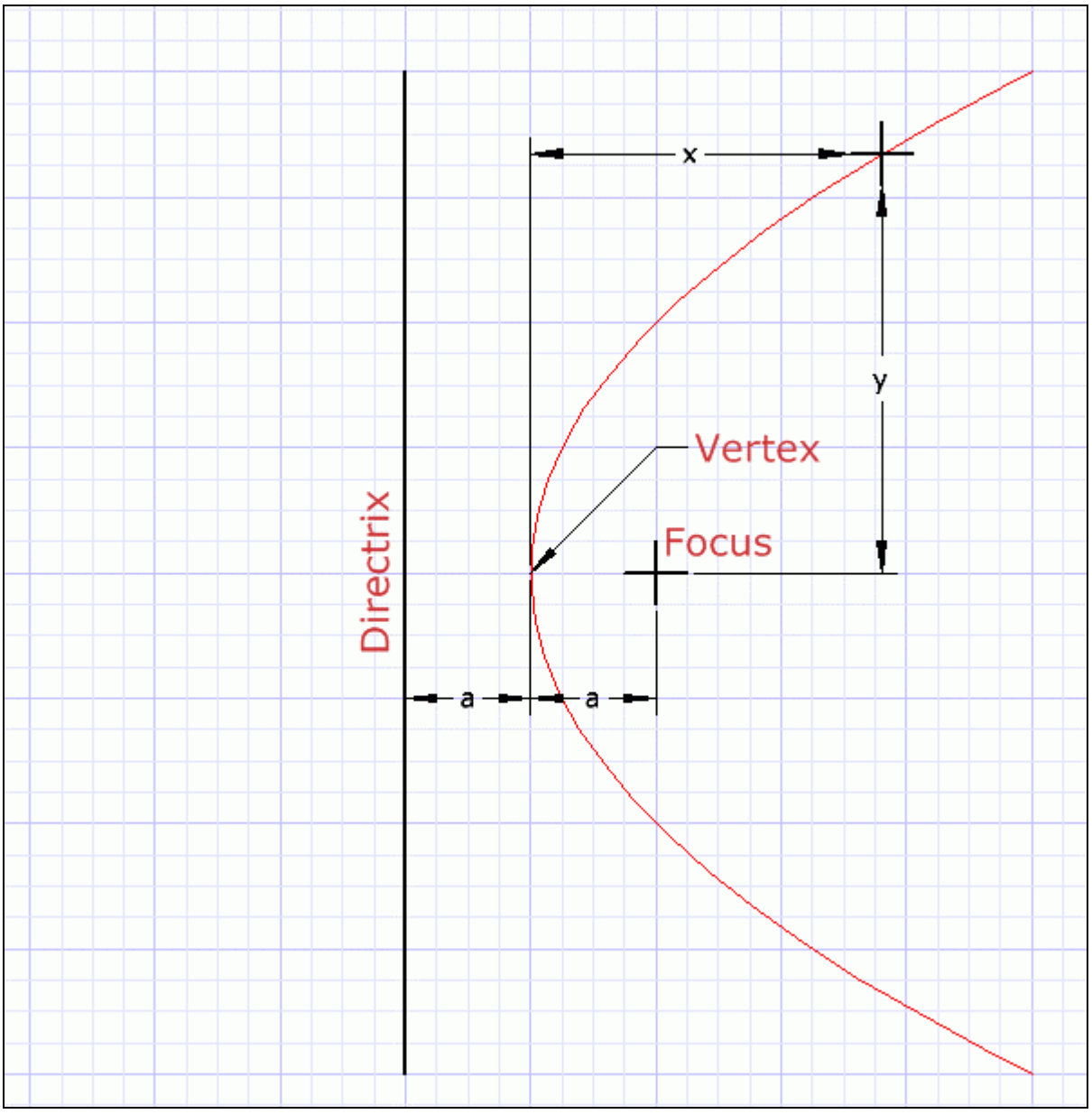
Parabolas Using Constraints

Constrained Drawing

About Parabolas:

A parabola is defined as the locus of all points equidistant from a line (the Directrix) and a point (the Focus).

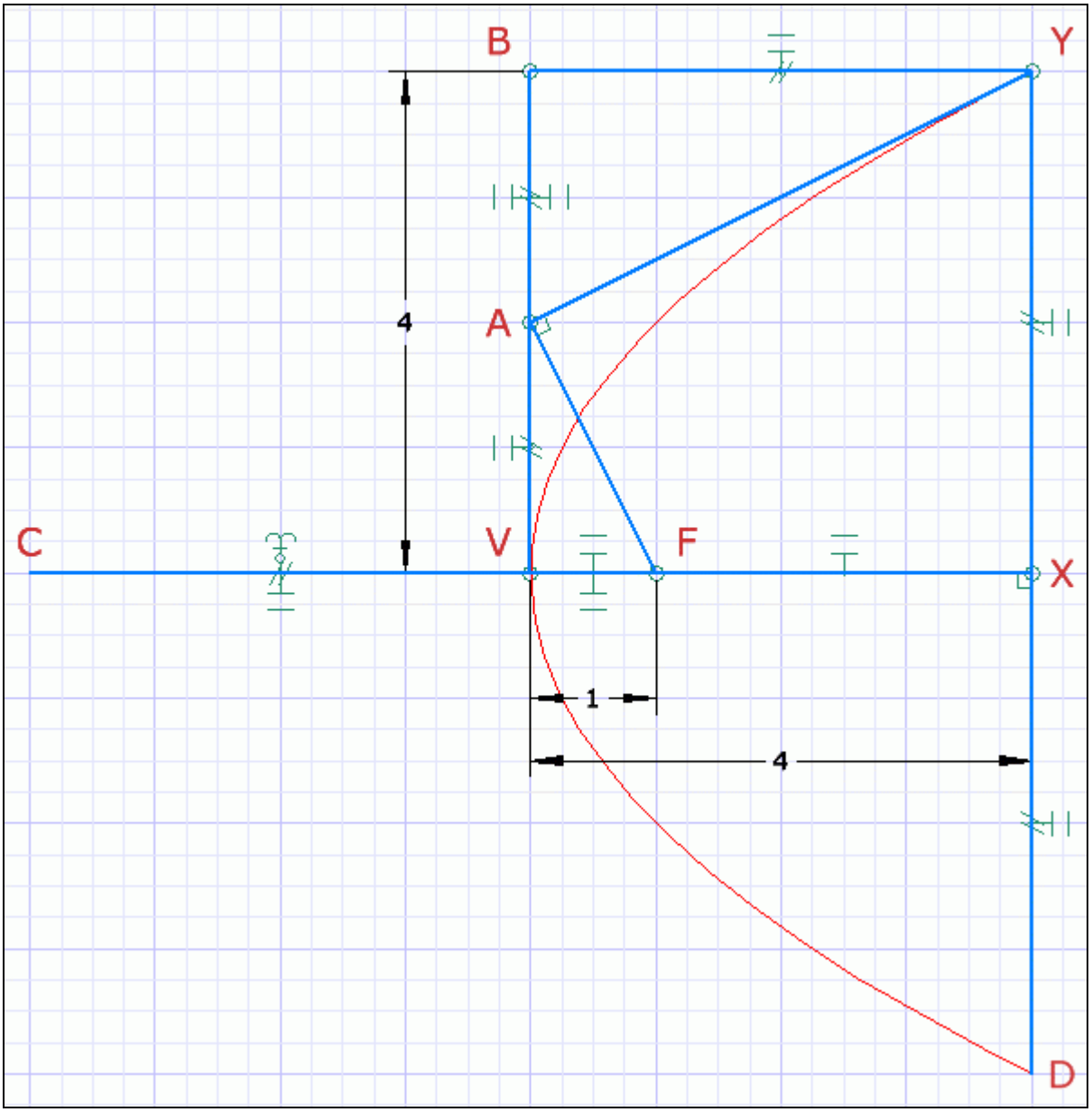
Equations:
If dimensions a and x are known, then $y^2 = 2ax$.
If dimensions a and y are known, then x = $y^2/2a$.
If dimensions x and y are known, then $a = y^2/2x$.



Construction:
In this fully constrained drawing, rectangle VBYX can have any aspect ratio.

- Lines VA and AB are equal in length.
- Line AF is perpendicular to line AY
- Lines CV and VX are equal in length.
- Point V is the parabola's Vertex
- Point F is the parabola's Focus

Notice that there are three dimensions. Any two of them can be used to constrain the drawing. The remaining dimension is only for information and is not needed. If all three are used the constrain the drawing, an "over constrained" condition will occur. Deleting any one of the three will resolve the problem.

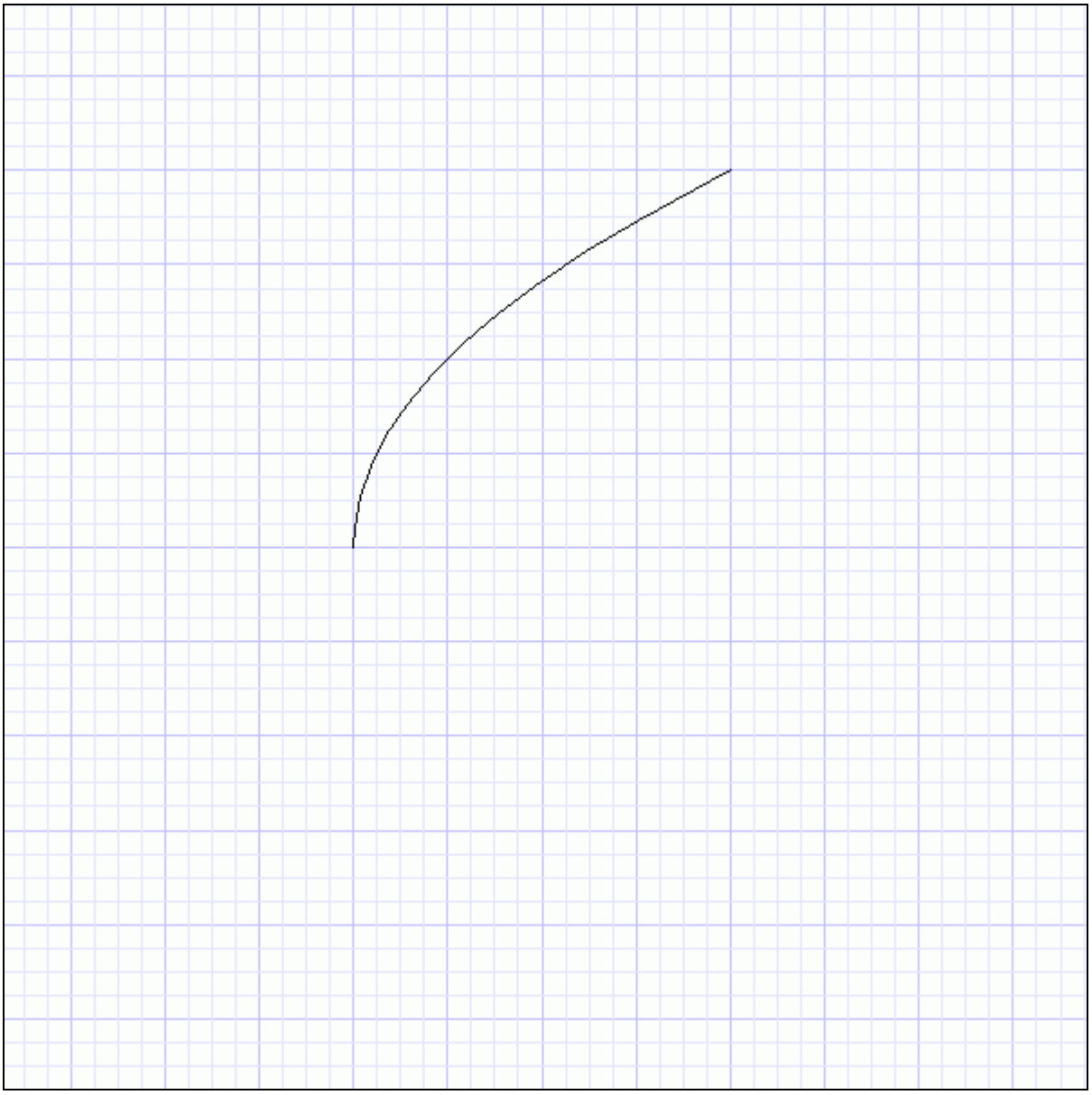


After setting up and assigning two dimensions, create the parabola by snapping a spline to the vertices at D, C, and Y.

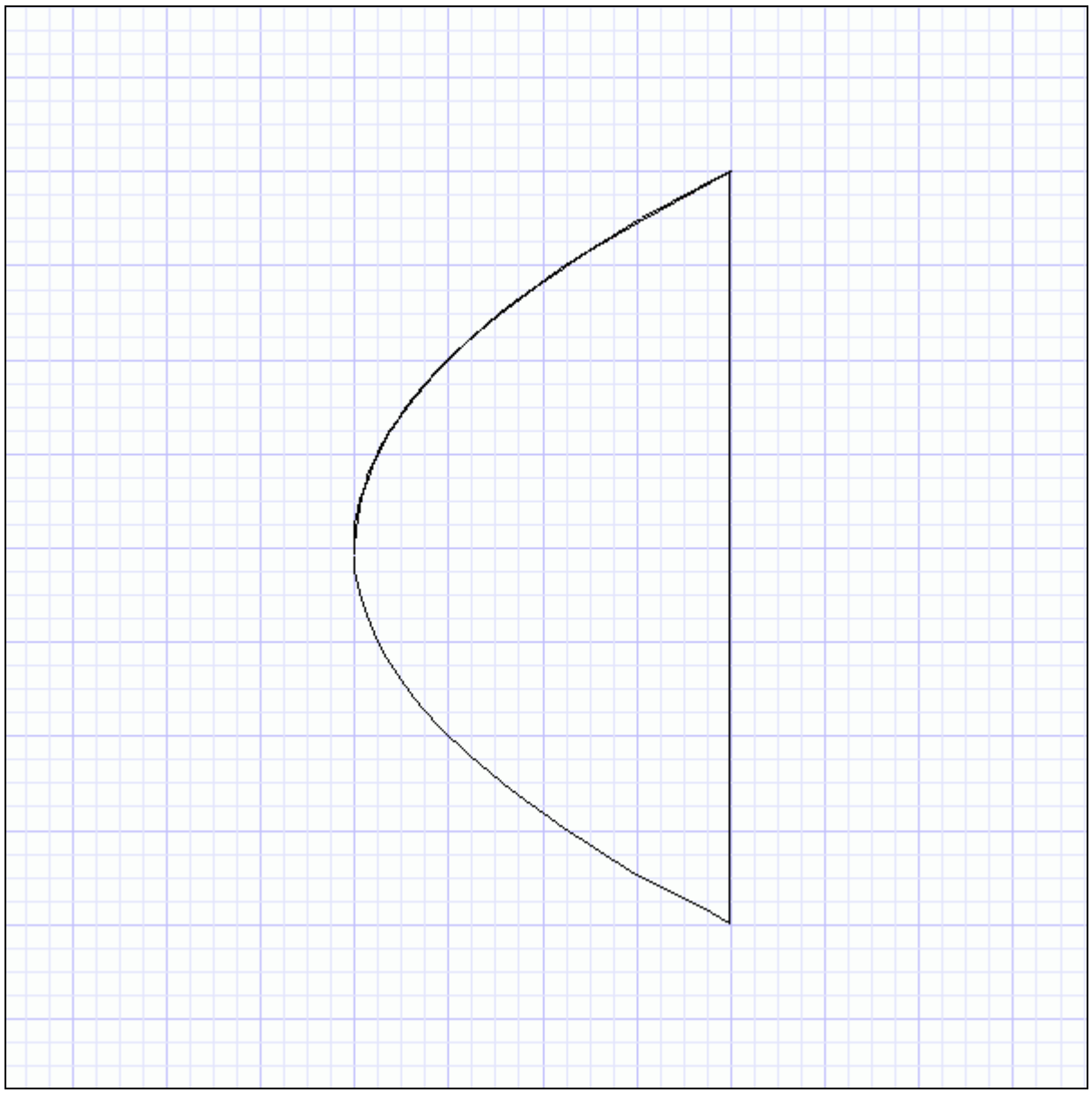
If you are working in 3D and wish to Revolve the parabola, then only half of the parabola is needed. To create the half-parabola, snap a spline to the vertices at points V, A, and Y.

Revolved Parabaloid

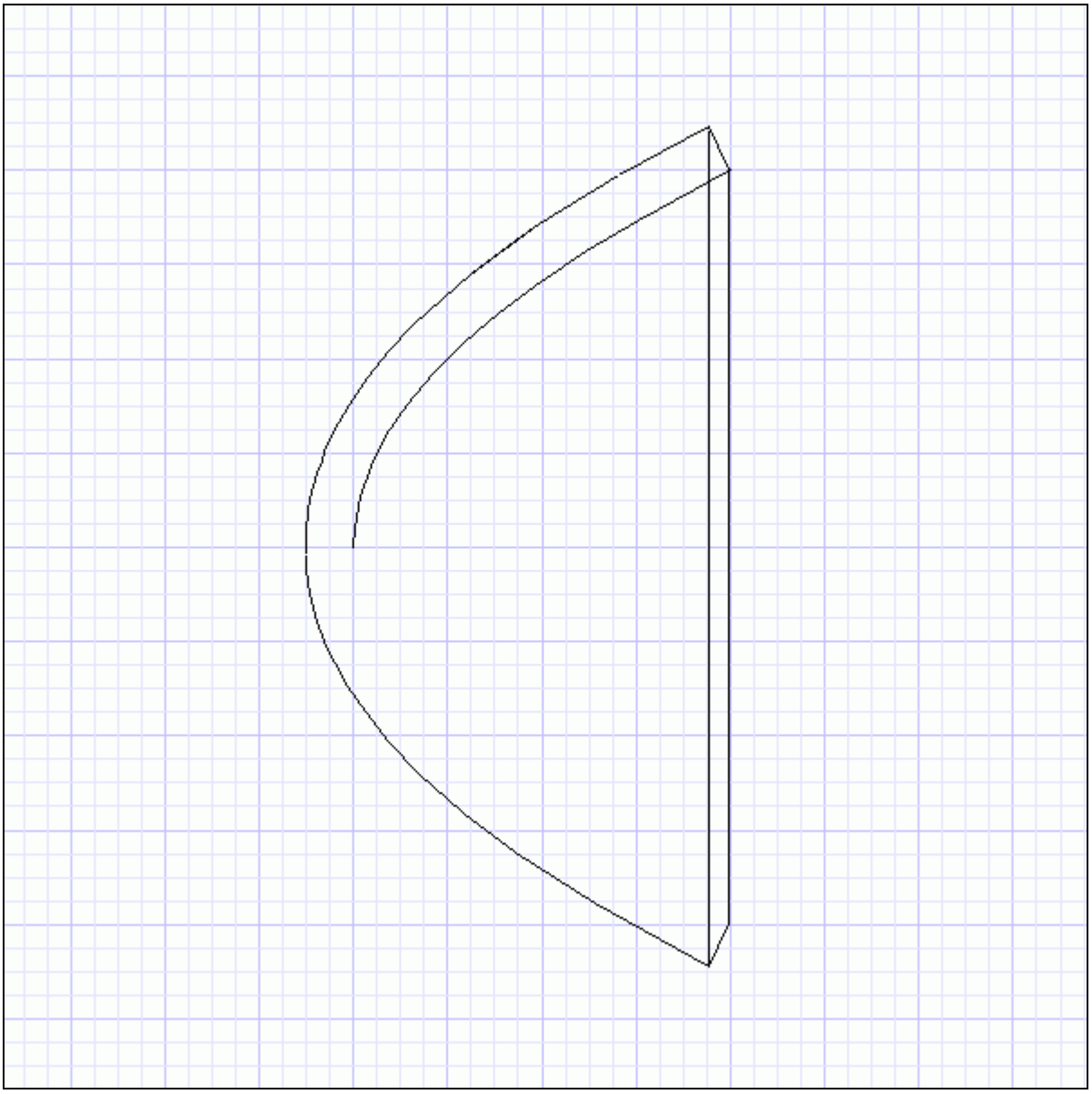
Start with a half-parabola.



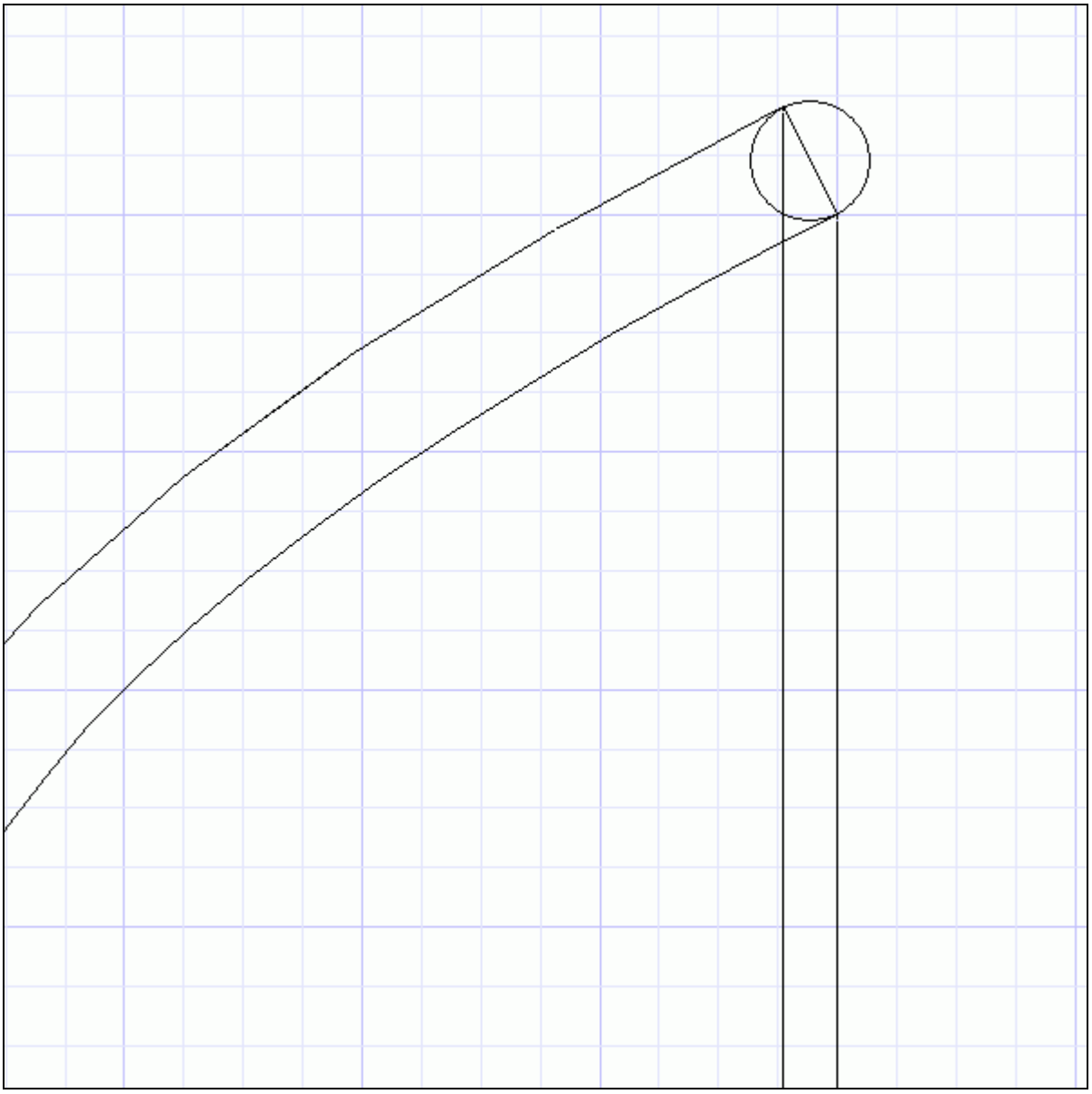
Revolve it.



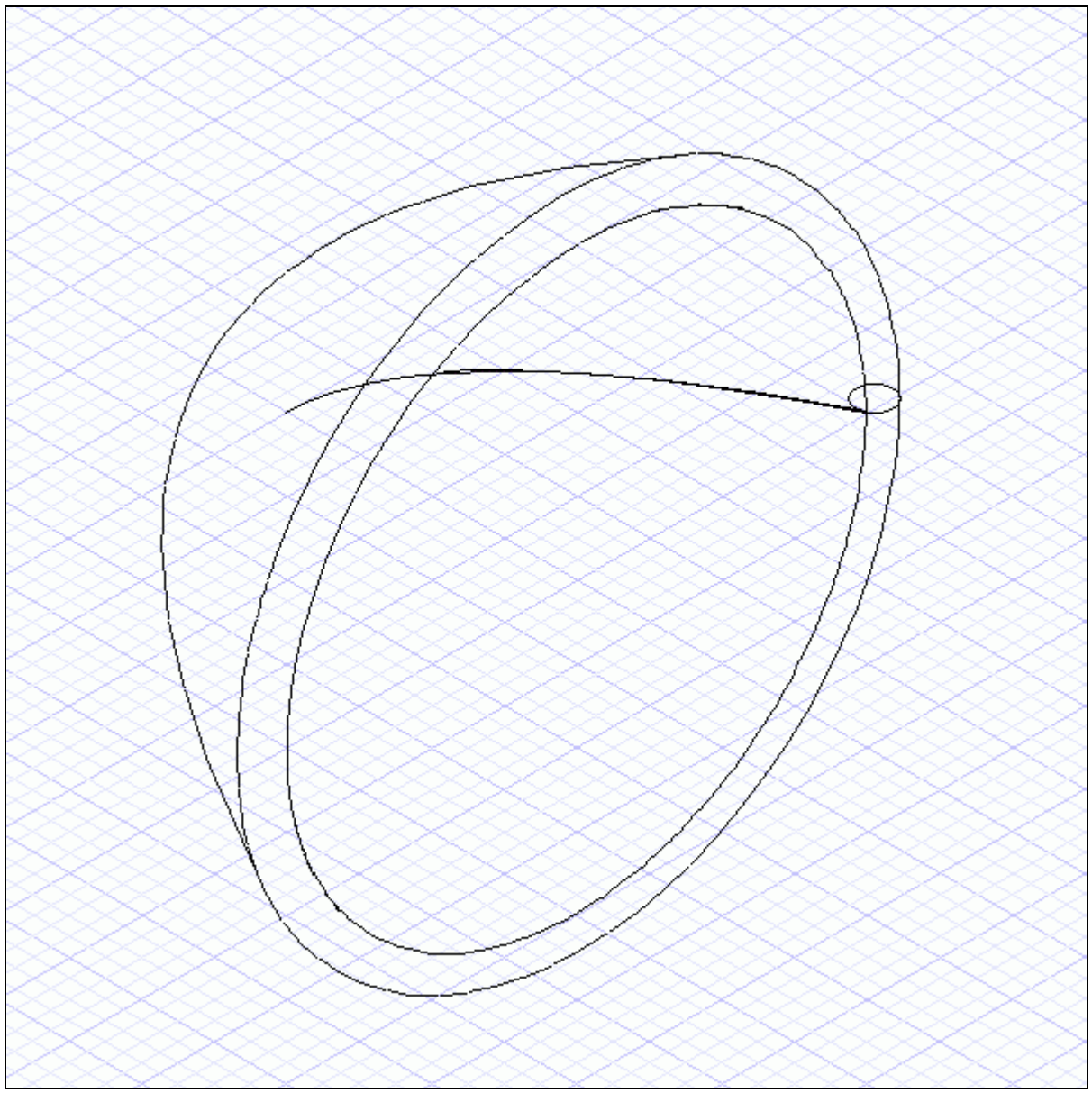
Shell to the desired thickness. Shell inward or outward to determine whether the outside of inside surface of the result conforms to the original half-parabola.



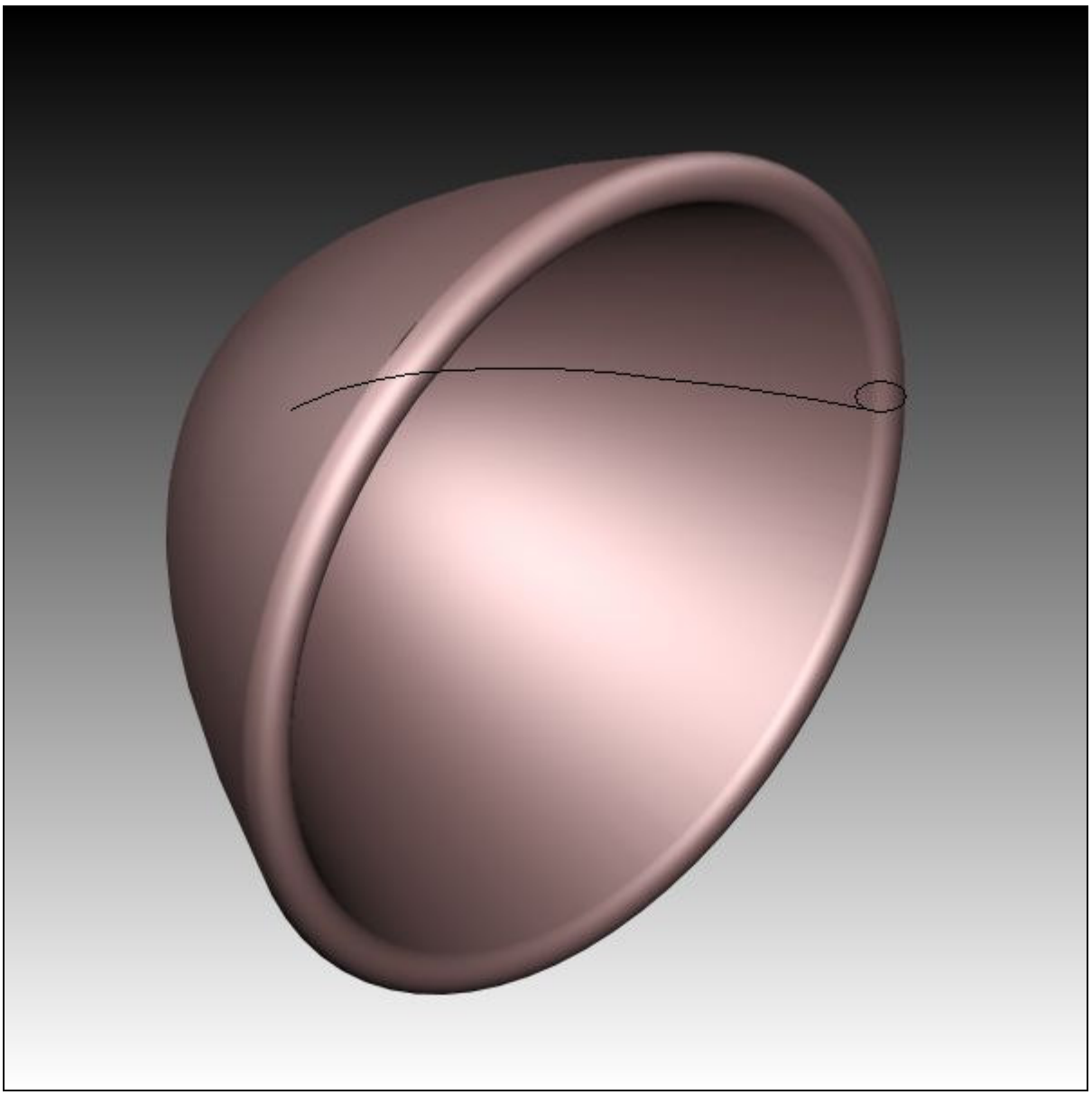
Proceed as follows to put a rounded edge on the parabaloid: Snap a Double Point Circle as shown.



Revolve the circle and add the result to the previous revolve.



Render



Revisions:

05/18/05
Original post