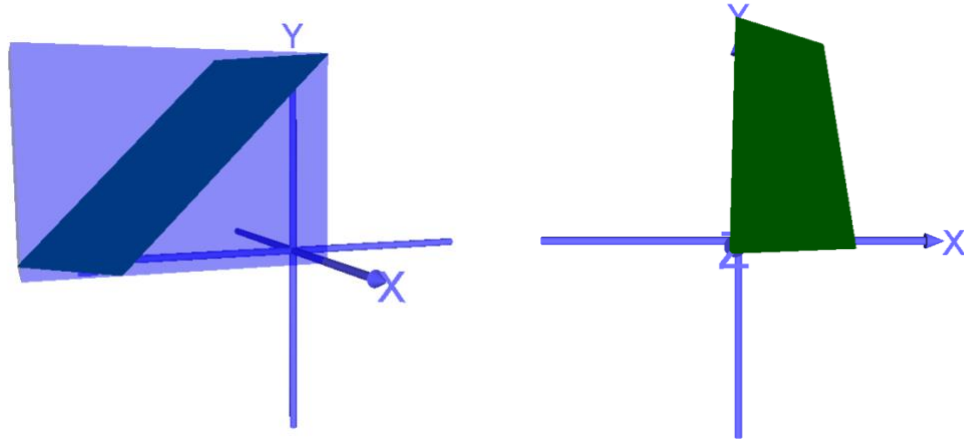


Name: YONG WEN SHIUAN

Last two digits of the matric card: 37

Q1a

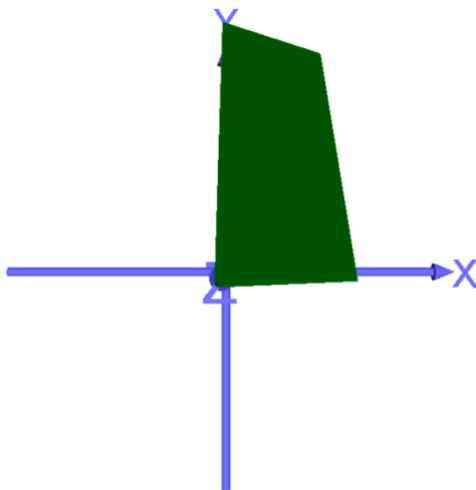
A plane passing through the points with coordinates (3, 7, 0), (0, 7, 3), (3, 0, 7).



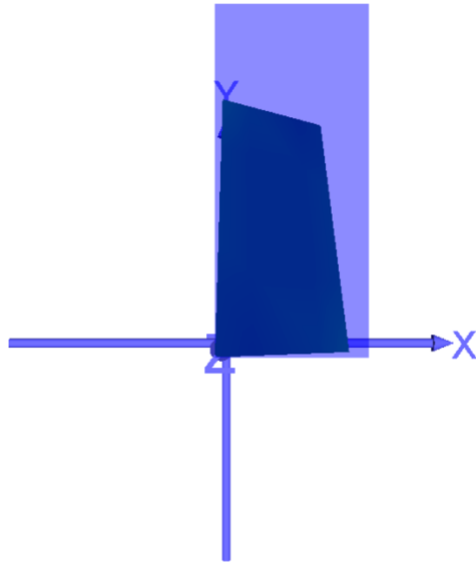
$x+y+z-10=0$;
 bboxCenter 1.5 3.5 5
 bboxSize 3.1 7.1 10.1
 resolution [2 2 2]

Name of the file: 1a.wrl

Additional screenshots explaining the selection of the sampling resolution, e.g., with a smaller and bigger resolutions. Write the tested resolutions.



Resolution: [75 75 75]

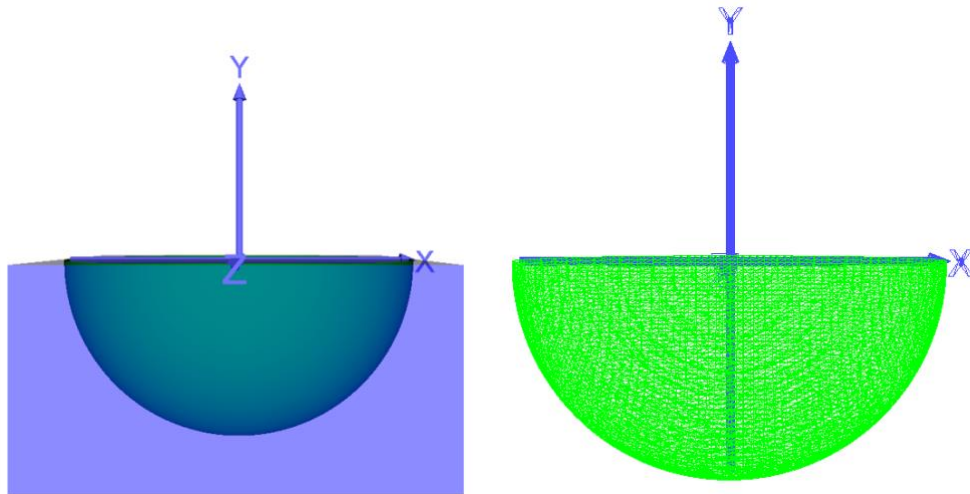


Resolution: [5 5 5]

Whether the x, y, z dimensions are divided into 2, 5, or 75 segments, since a segment can be defined by 2 points, i.e. a segment, only a minimal sampling resolution of 2 is needed to display the plane bounded by straight lines

Q1b

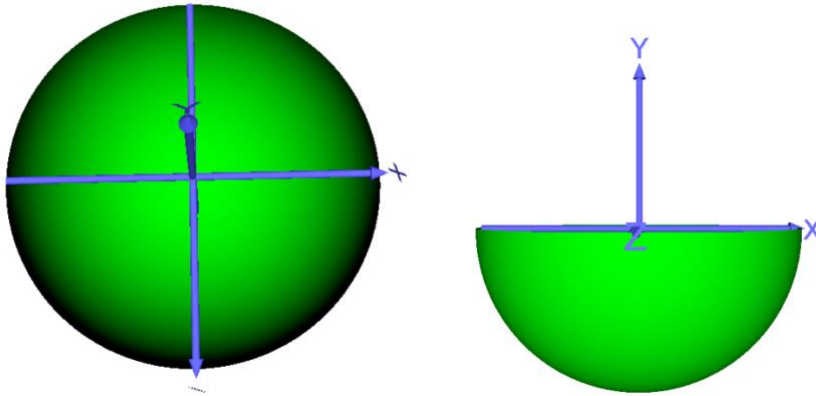
A lower half of the surface of the origin-centered sphere with radius 7.



$49-x^2-z^2-y^2=0;$
bboxCenter 0 -3.5 0
bboxSize 14.1 7.1 14.1
Resolution: [50 50 50]

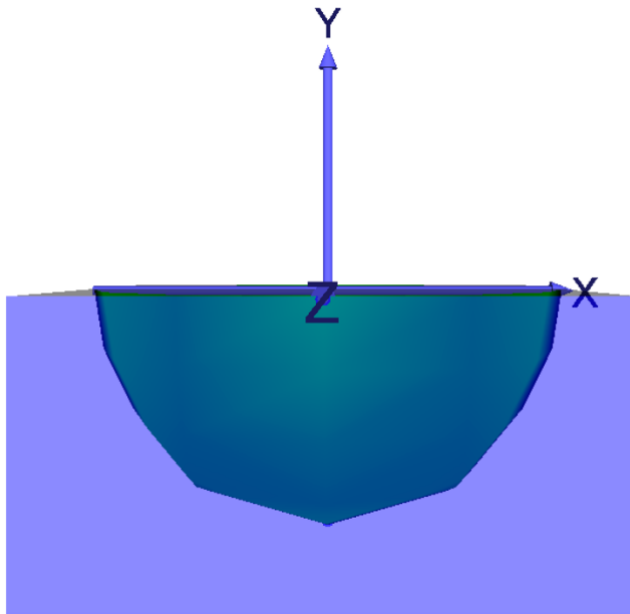
Compared to parametric rendering, it seems [50 50 50] produces smaller polygons than [50 50 50] for parametric rendering

Name of the file: 1b.wrl



resolution [75 75 75]

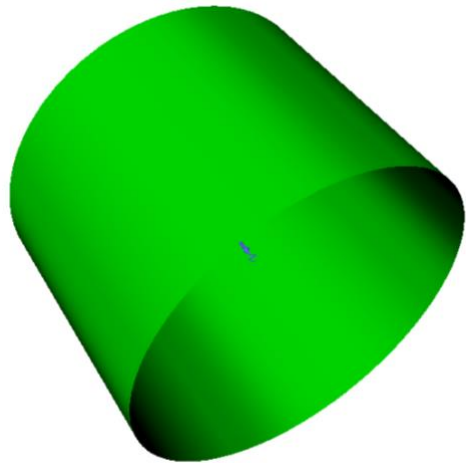
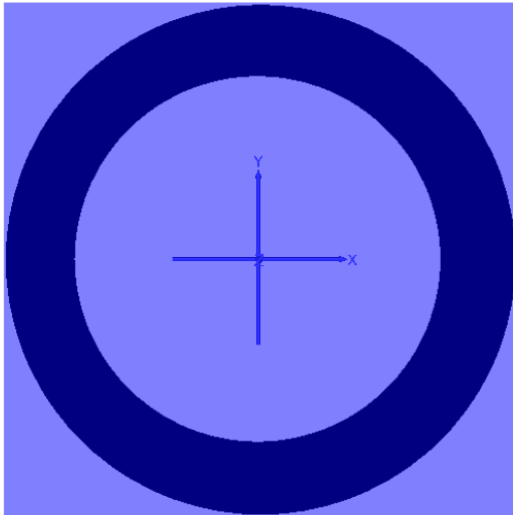
If the x, y, z dimensions are divided into even more segments, e.g. 75, a smooth curvature is seen. The straight lines connecting the polygons are not as striking. But further such increases in resolution would result in minor changes to the shape curvature at the expense of additional computations and hence additional time taken to load the shape



Resolution: [5 5 5]

If the x, y, z dimensions are divided into fewer segments, e.g. 5, the lines of the polygons involved in polygonal interpolation that's used to create the surface can be observed distinctly, resulting in a not-so-rounded surface.

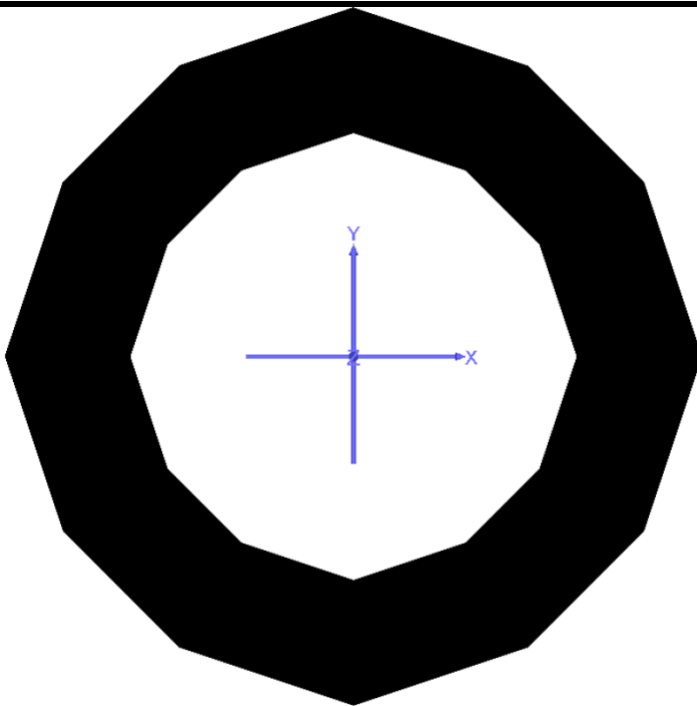
Q1c



```
x^2+y^2-49=0;  
bboxCenter 0 0 2  
bboxSize 14.1 14.1 10.1  
resolution [25 25 25]
```

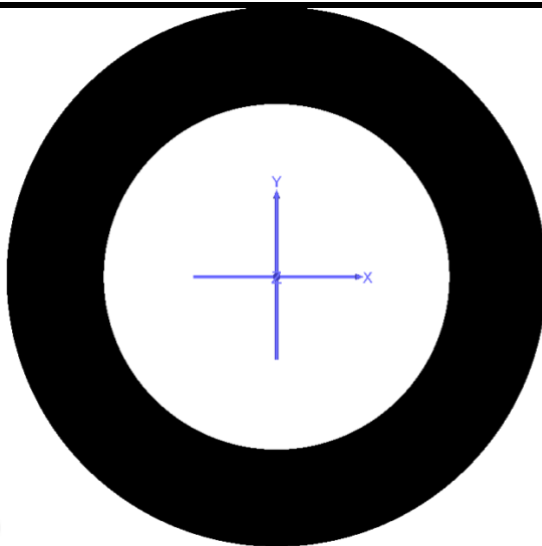
At this resolution, a smooth curvature can be observed

Name of the file: 1c.wrl



Resolution: [5 5 5]

If the x, y, z dimensions are divided into too few segments, e.g. 5, the smooth curvature is not seen. The straight lines connecting the polygons can be observed



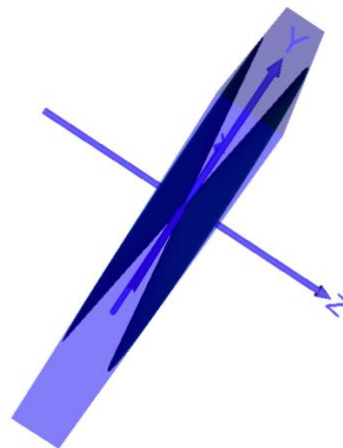
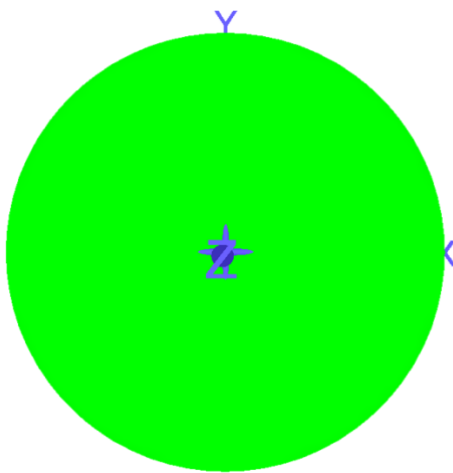
Resolution: [75 75 75]

If the x, y, z dimensions are divided into even more segments, e.g. 75, a smooth curvature is seen. The straight lines connecting the polygons are not as striking. But further such increases in resolution would result in minor changes to the shape curvature at the expense of additional computations and hence additional time taken to load the shape

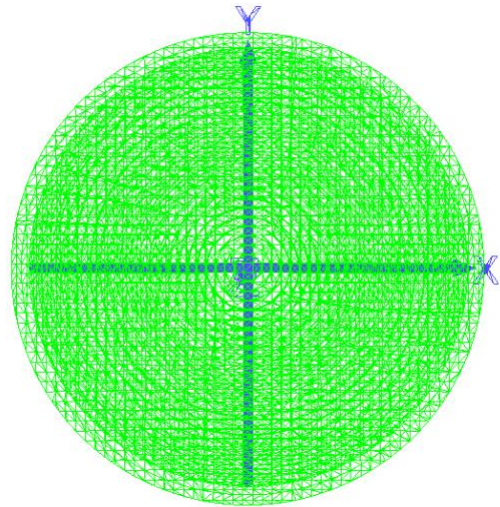
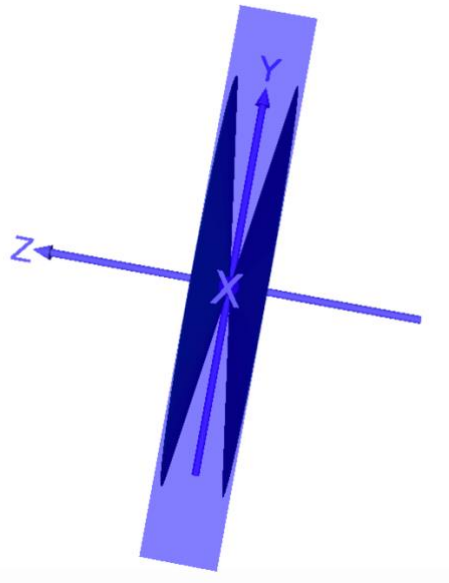
Q1d

A two-side conical surface with radius 7 at distance 1 from its apex. The cone is aligned with axis Z, and spans from $z'' = -1$ to $z'' = 1$ with the cone apex located at the origin.

$z^2 - (x/7)^2 - (y/7)^2 = 0;$
bboxCenter 0 0 0
bboxSize 15 15 2.1
resolution [25 25 25]

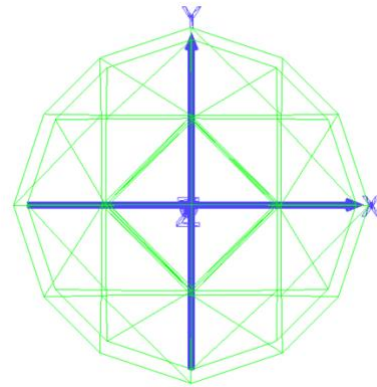
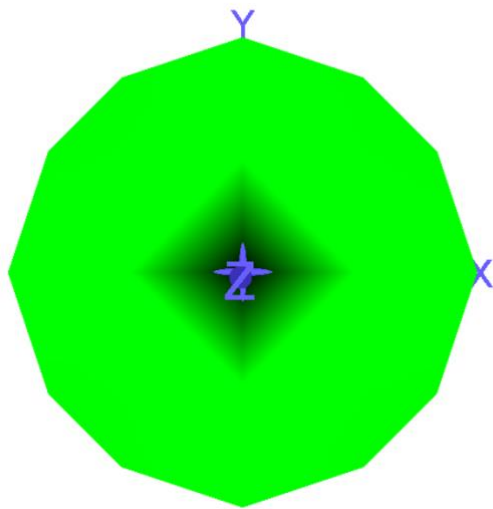


Name of the file: 1d.wrl



Resolution: [50 50 50]

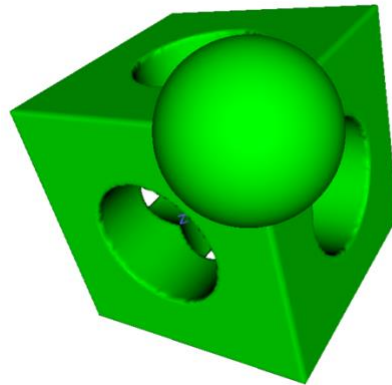
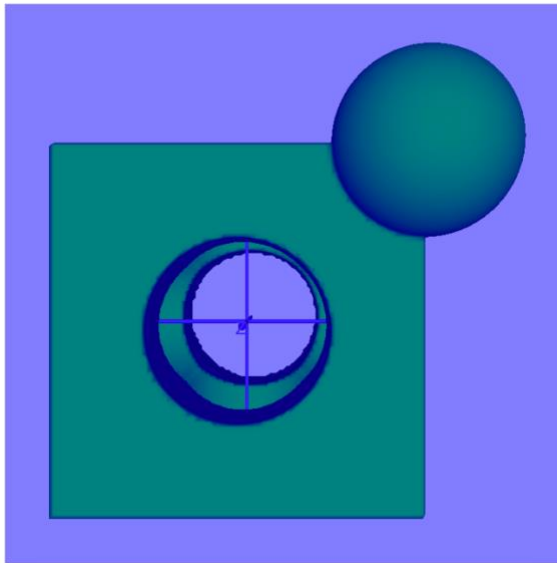
If the x, y, z dimensions are divided into even more segments, e.g. 50, a smooth curvature is seen. The straight lines connecting the polygons are not as striking. But further such increases in resolution would result in minor changes to the shape curvature at the expense of additional computations and hence additional time taken to load the shape



Resolution: [5 5 5]

If the x, y, z dimensions are divided into too few segments, e.g. 5, the smooth curvature is not seen. The straight lines connecting the polygons can be observed

Q2



Design sketch number 7: $(\text{Box} \setminus \text{Cylinder} \setminus \text{Cylinder} \setminus \text{Cylinder}) \cup \text{Sphere}$

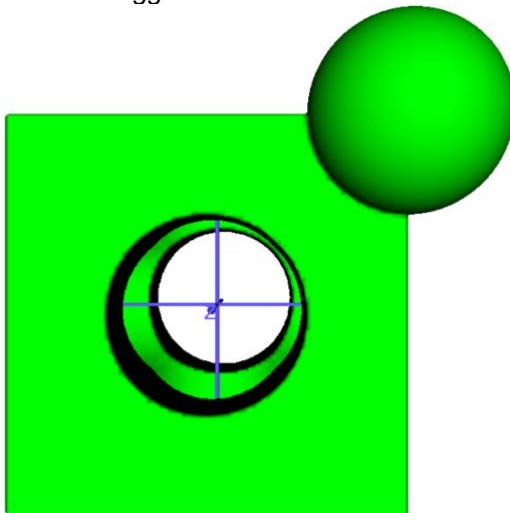
- Box is an origin centred cube of length 4
- Cylinders are Origin centred with radius 1 and length 4
- Sphere has radius 1 with centre at (2 2 2)

```
bboxCenter 0.5 0.5 0.5  
bboxSize 5.1 5.1 5.1  
resolution [100 100 100]
```

A slightly higher resolution was selected so that the edges of the cube would look sharper and avoid revealing the polygonal interpolation of the surface.

Name of the file: 2.wrl

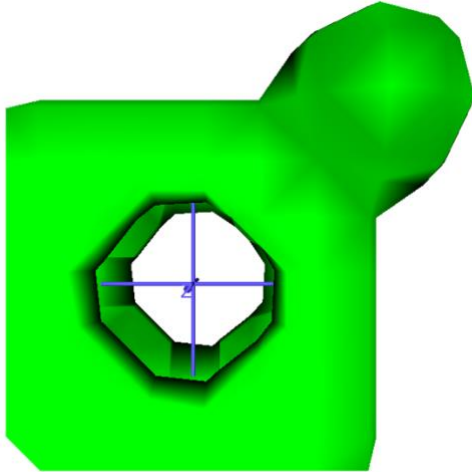
Additional screenshots explaining the selection of the sampling resolution, e.g., with a smaller and bigger resolutions. Write the tested resolutions.



```
resolution [110 110 110]
```

If the x, y, z dimensions are divided into even more segments, e.g. 110, the shape looks sharper. But further such increases in resolution would be at the expense of additional computations and hence additional time taken to load the shape. If resolution is increased

even further, it would likely take more than 5 seconds to load the shape. Even at this resolution, it takes slightly less than 5 seconds to load.



resolution [10 10 10]

If the x, y, z dimensions are divided into too few segments, e.g. 10, the smooth curvature of the sphere is not seen. The outer lines connecting the polygons can be observed and the shape does not look like how it should.

Q3

To obtain the desired equation, first we have to offset and then scale the curve to make the range lie within [0 1].

Although bboxSize is 5.1, the x domain is rounded off such that x lies within [-2 3] for simplicity.

Also, since $u=x$, u takes the x-value of the bounding box and varies from minimum to maximum x-value of the bounding box.

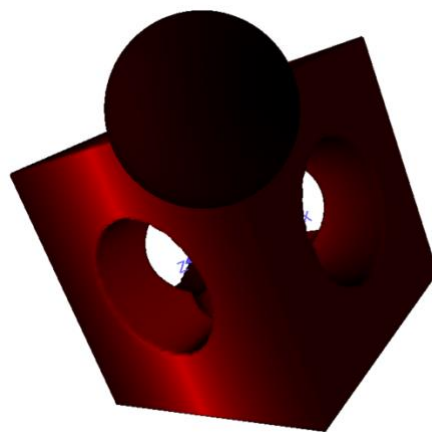
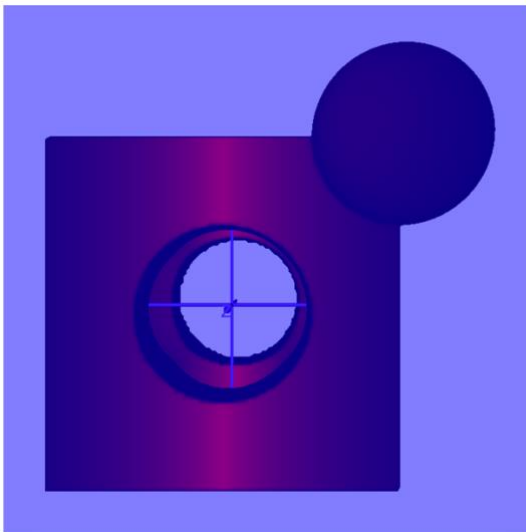
Initial function: $r=3/(\sqrt{\text{abs}(u)+1})$;

First, offset by $-3/2$ such that the minimum point of the curve outputs $r = 0$:

$r= (3/(\sqrt{\text{abs}(u)+1}))-3/2$;

Next, scale by $(1/1.5)$ such that the maximum point of the curve outputs $r = 1$:

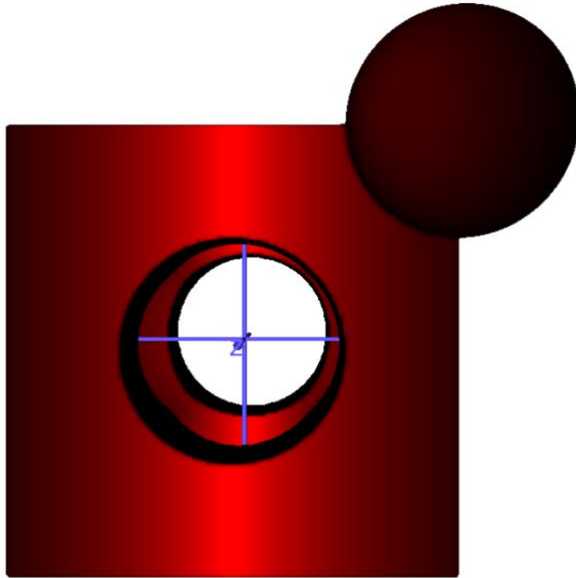
$r=(1/1.5)*(3/(\sqrt{\text{abs}(u)+1}))-3/2$;



resolution [100 100 100]

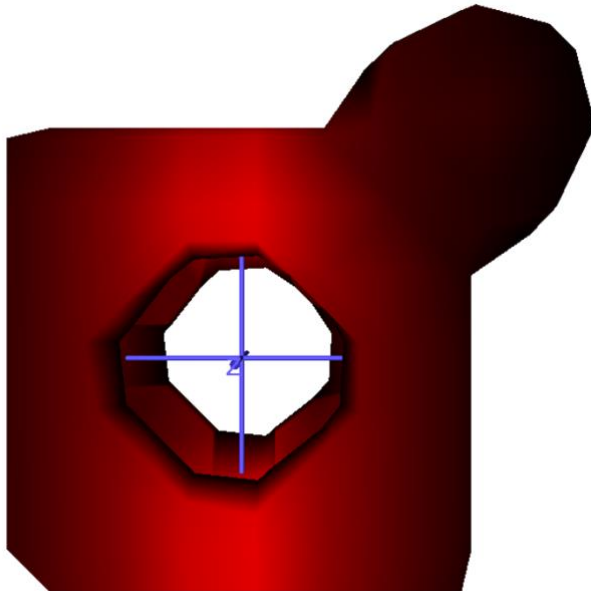
3.wrl

Additional screenshots explaining the selection of the sampling resolution, e.g., with a smaller and bigger resolutions. Write the tested resolutions.



resolution [120 120 120]

If the x, y, z dimensions are divided into even more segments, e.g. 120, the shape looks sharper. But further such increases in resolution would be at the expense of additional computations and hence additional time taken to load the shape. If resolution is increased even further, it would likely take more than 5 seconds to load the shape. Even at this resolution, it takes only slightly less than 5 seconds to load.



resolution [10 10 10]

If the x, y, z dimensions are divided into too few segments, e.g. 10, the smooth curvature of the sphere is not seen. The outer lines connecting the polygons can be observed and the shape does not look like how it should.