

CZ2003 Tutorial 6 (2022/23, Semester 1)

Solid Objects

1. Define the three-dimensional solid object displayed in Figure Q1

(i) by functions $x(u,v,w)$, $y(u,v,w)$, $z(u,v,w)$, $u \in [0,1]$, $v \in [0,1]$

(ii) by functions $f(x,y,z) \geq 0$

Display the two solid objects and attach screenshots of ShapeExplorer.

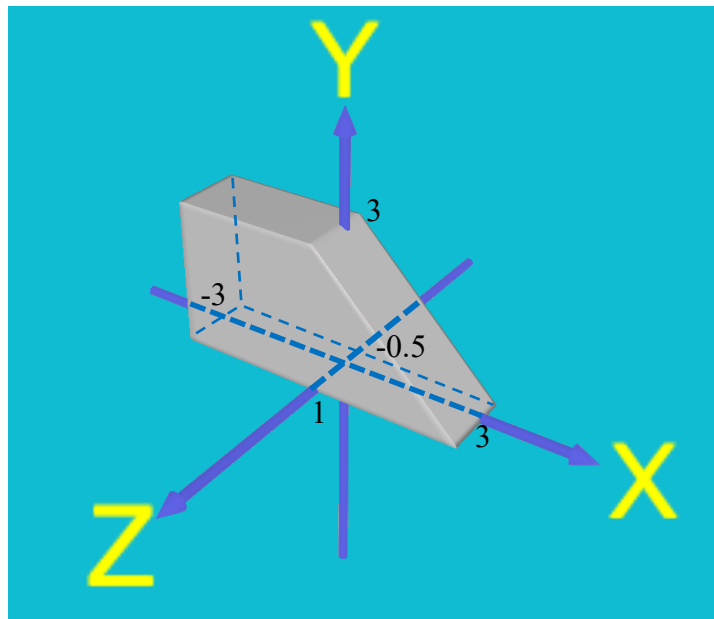


Figure Q1

2. A curve displayed in Figure Q2 (left) is defined in polar coordinates r and α by the function $r = 1.2 \sin(2\alpha - 0.5\pi)$, $\alpha \in [0, 2\pi]$. Propose parametric functions $x(u, v)$, $y(u, v)$, $u, v \in [0, 1]$ defining the 2D solid shape located in the XY Cartesian coordinates system as it is displayed in Figure Q2 (right). **Display the shape and attach a screenshot of ShapeExplorer.**

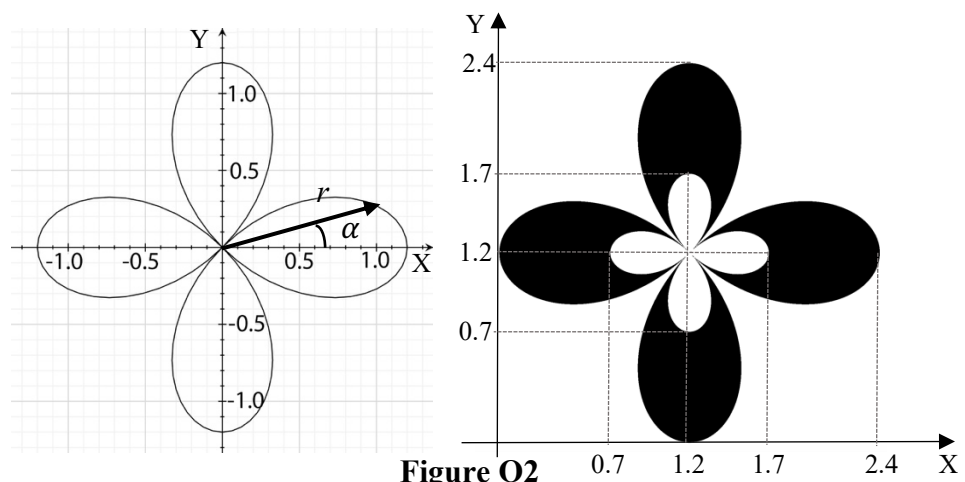


Figure Q2

3. Define parametrically with functions $x(u, v, w)$, $y(u, v, w)$, $z(u, v, w)$, $u, v, w \in [0, 1]$ the solid object displayed in Figure Q3. The object is created by rotational sweeping **counterclockwise** by $5\pi/4$ about axis Y of the sinusoidal curve followed by translational sweeping by +1.5 units parallel to axis Y. **Display the shape and attach a screenshot of ShapeExplorer.**

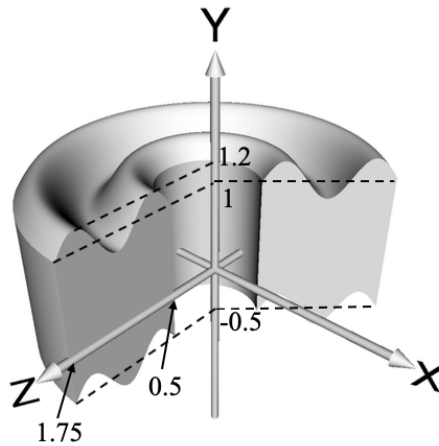


Figure Q3

4. The solid object displayed in Figure Q4 (front and back views) is constructed from a 3-sided pyramid with height 1 and a cylinder which has the height 2, the outer radius 0.5, and the inner radius 0.25.
- Define the pyramid and the cylinder by functions $f(x, y, z) \geq 0$.
 - Based on the definition obtained in part (i), define the final solid object.

Display the shape and attach a screenshot of ShapeExplorer.

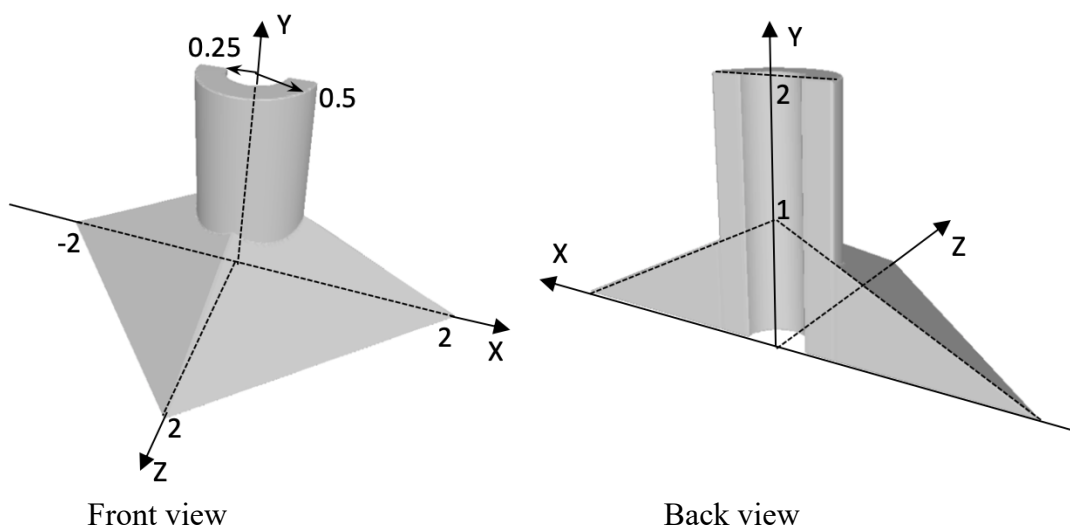


Figure Q4