CZ2003: Lab 5

Name:	**Last two digits of the matric card:**

Q1a

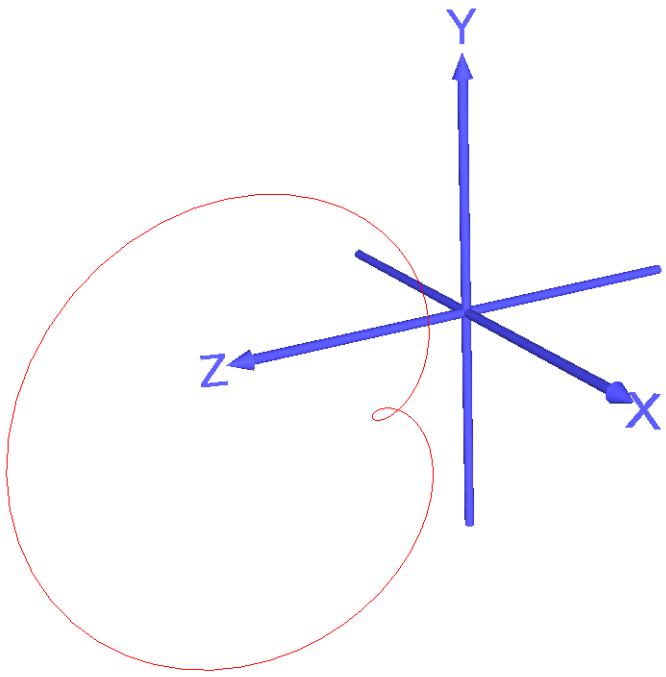
Transformation Matrix:
Translation * Rotation * Translation

$$\begin{bmatrix}1 & 0 & 0 & 7\\ 0 & 1 & 0 & 0\\ 0 & 0 & 1 & 0\\ 0 & 0 & 0 & 1\end{bmatrix}\begin{bmatrix}\cos\left(\frac{\pi}{2}\right) & 0 & \sin\left(\frac{\pi}{2}\right) & 0\\ 0 & 1 & 0 & 0\\ -\sin\left(\frac{\pi}{2}\right) & 0 & \cos\left(\frac{\pi}{2}\right) & 0\\ 0 & 0 & 0 & 1\end{bmatrix}\begin{bmatrix}1 & 0 & 0 & -7\\ 0 & 1 & 0 & 0\\ 0 & 0 & 1 & 0\\ 0 & 0 & 0 & 1\end{bmatrix} = \begin{bmatrix}0 & 0 & 1 & 7\\ 0 & 1 & 0 & 0\\ -1 & 0 & 0 & 7\\ 0 & 0 & 0 & 1\end{bmatrix}$$

$$\begin{bmatrix}0 & 0 & 1 & 7\\ 0 & 1 & 0 & 0\\ -1 & 0 & 0 & 7\\ 0 & 0 & 0 & 1\end{bmatrix}\begin{bmatrix}x\\ y\\ z\\ 1\end{bmatrix} = \begin{bmatrix}z+7\\ y\\ -x+7\\ 1\end{bmatrix}$$

Q1b

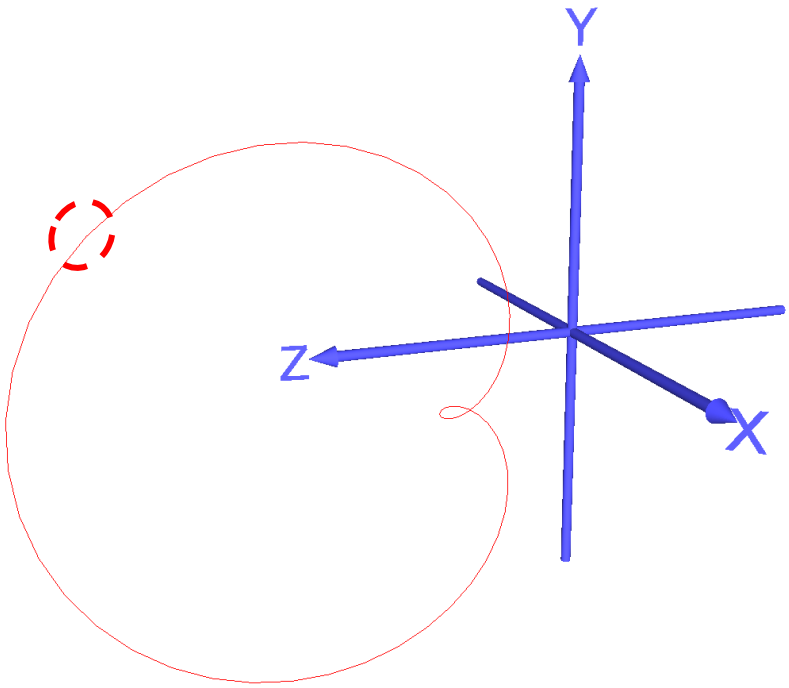
Limaçon Curve 1



Sampling resolution [70]

Name of the file: Q1b.wrl

Limaçon Curve 2



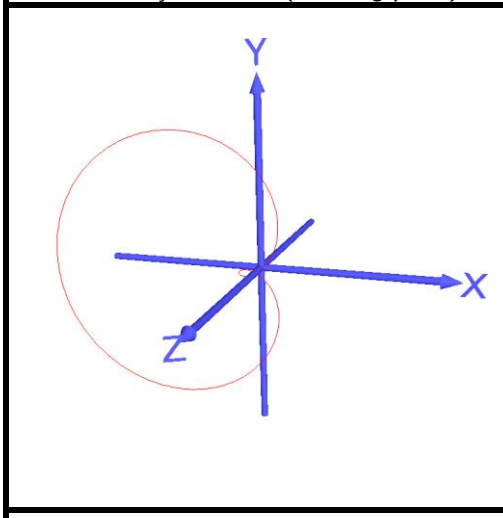
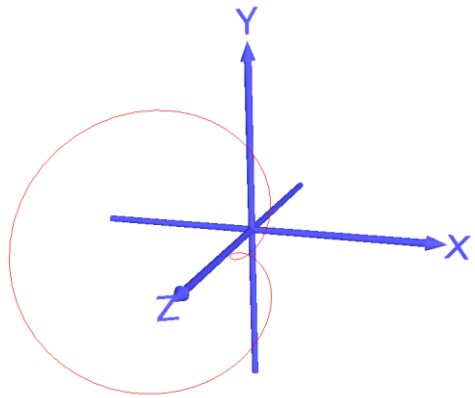
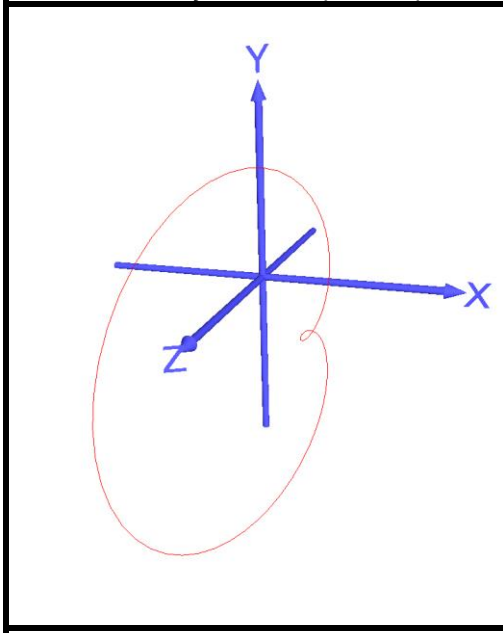
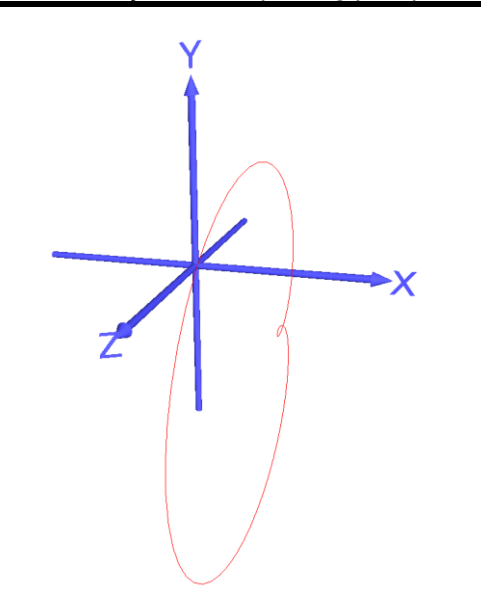
Sampling resolution [60]

Note

As shown in Limaçon curve 2, when the sampling resolution is reduced to 60, notice line is form on the Limaçon curve.
As the Limaçon curve is obtained from experiment 1 (exercise 3), after applying Q1a matrix to it, the Limaçon curve is moved to a new position.

In conclusion, the minimum sampling resolution for Limaçon curve is [70].

Q2

Limaçon Curve (Starting point)	Limaçon Curve (rotation)
	
Limaçon Curve (rotation)	**Limaçon Curve (Ending point)**
	

Sampling resolution [70]
Cycle Interval 5

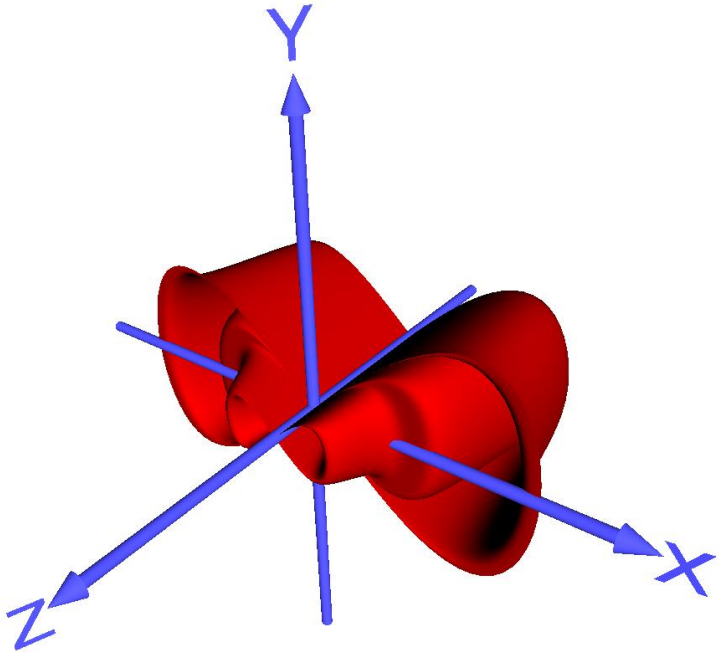
Name of the file: Q2.wrl

As shown above are a few screenshots of the Limaçon Curve rotating motion. The rotation motion can be seen in the Q2.wrl. The cycle interval is set to 5 is to indicate the 5 seconds rotation motion. Thus, any value higher will slow down the rotation motion and any value lower will speed up the rotation motion. The deceleration speed of the rotation motion is determined by (sin(pi/2*t)).

In conclusion, the minimum sampling resolution for the rotation motion Limaçon Curve is [70] and cycle interval is 5.

Q3a

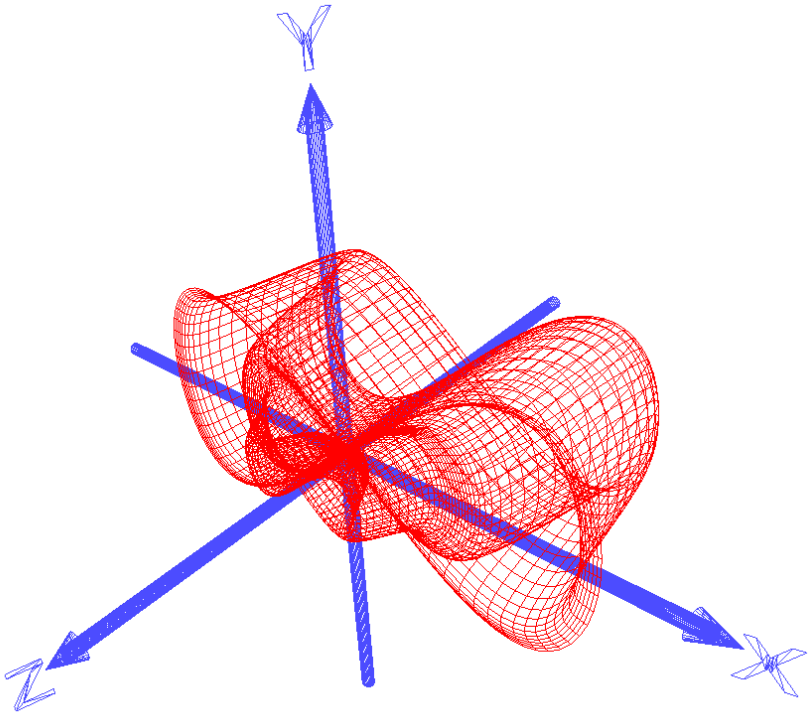
Shape2 (1)



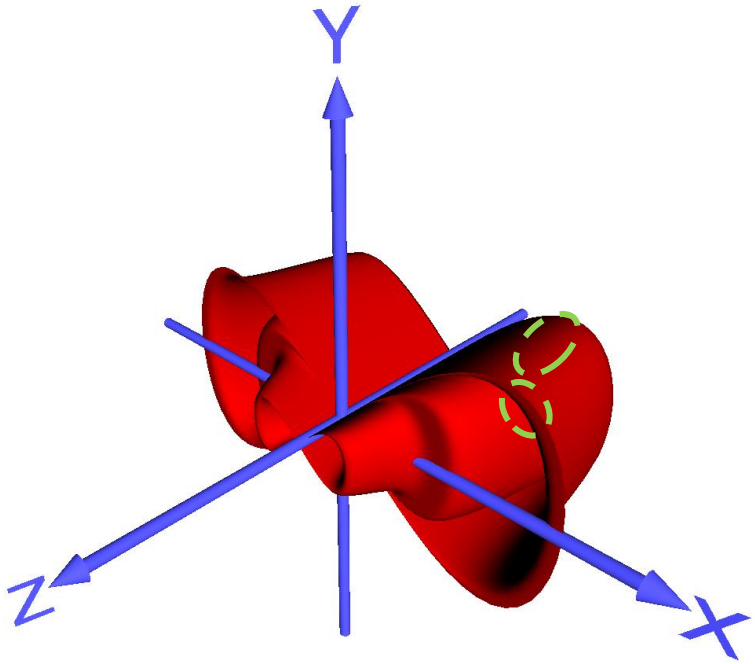
Sampling resolution [80 80]

Name of the file: Q3a_Shape2.wrl

Shape2 (1) wireframe

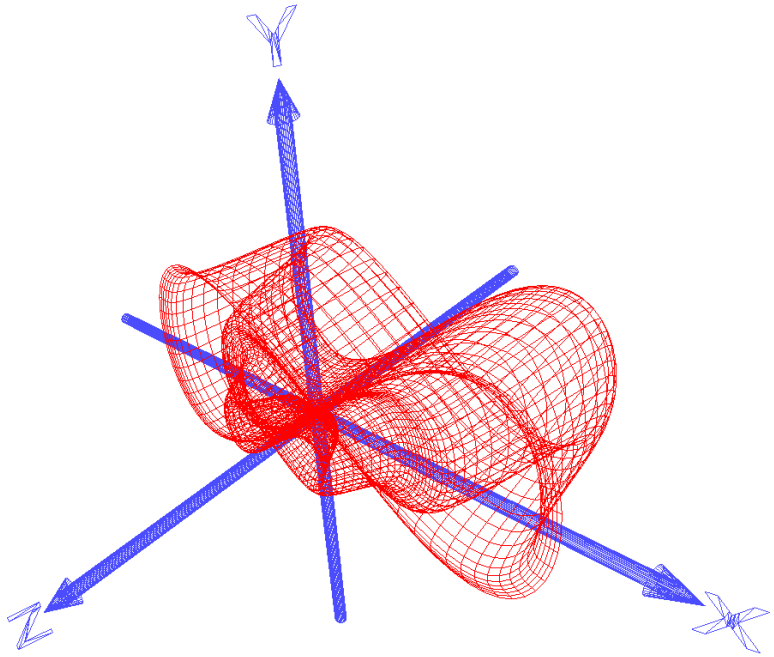


Shape2 (2)



Sampling resolution [70 70]

Shape2 (2) wireframe

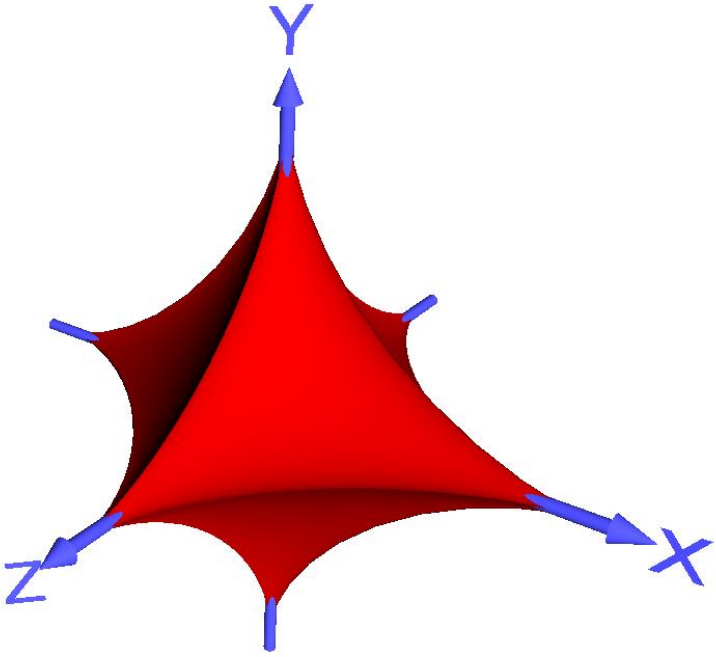


Note

As shown on Shape2 (2), when the sampling resolution is reduced to [70 70], notice lines are form on the curve and black lines are form on the surfaces of the shape.

In conclusion, the minimum sampling resolution for Shape2 is [80 80].

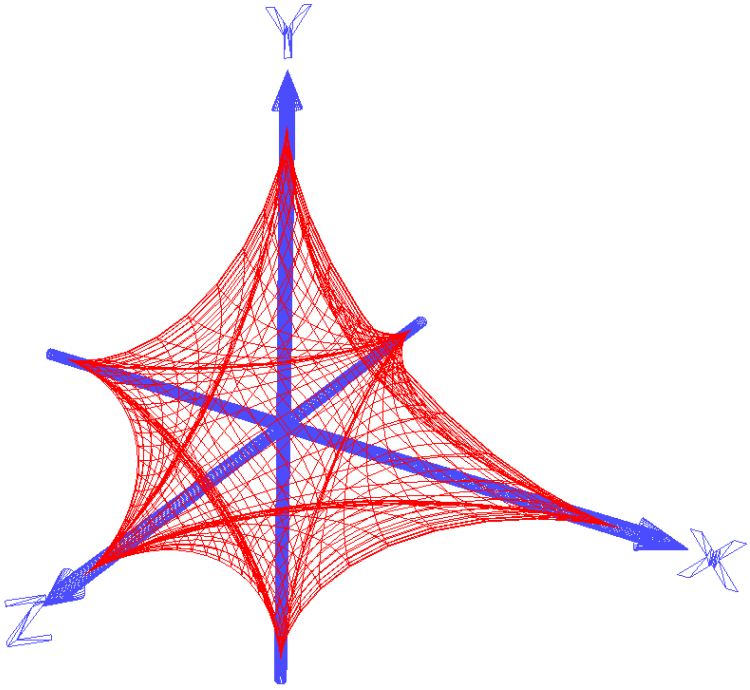
Shape8 (1)



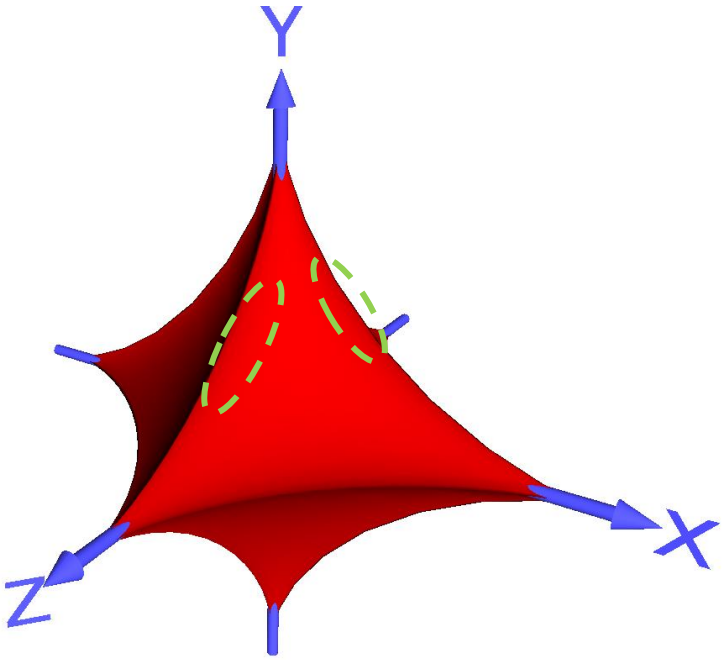
Sampling resolution [50 50]

Name of the file: Q3a_Shape8.wrl

Shape8 (1) wireframe

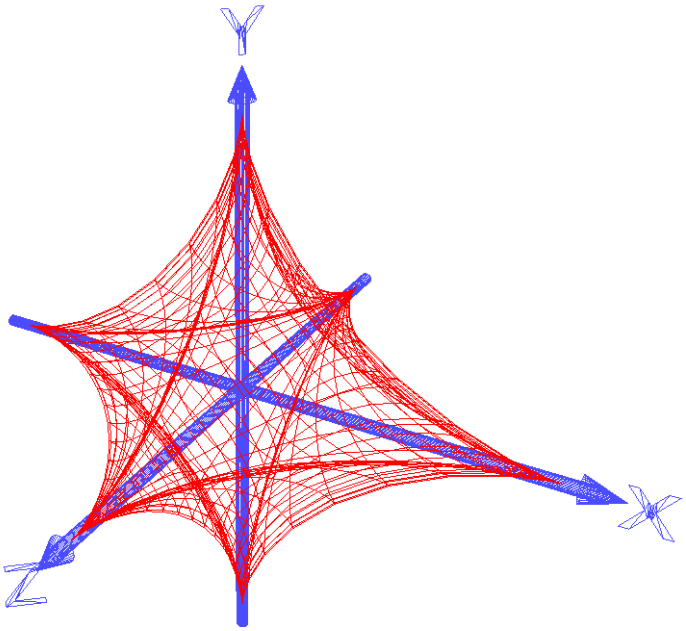


Shape8 (2)



Sampling resolution [40 40]

Shape8 (2) wireframe

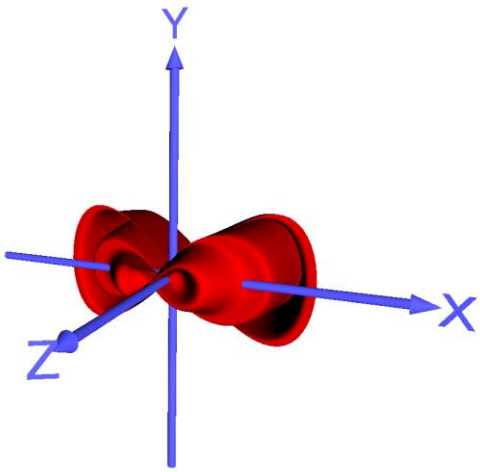
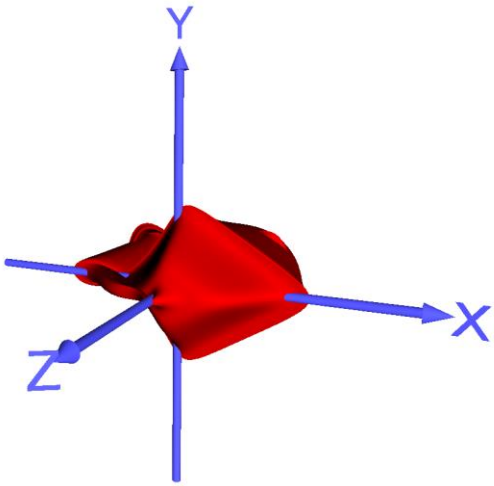
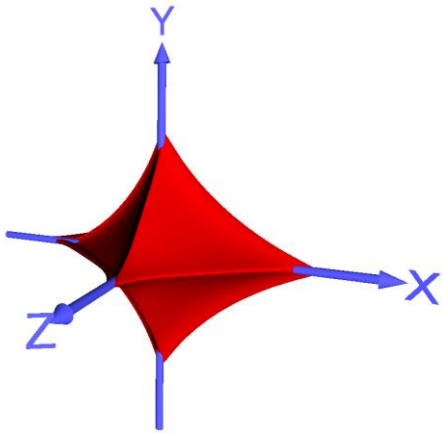
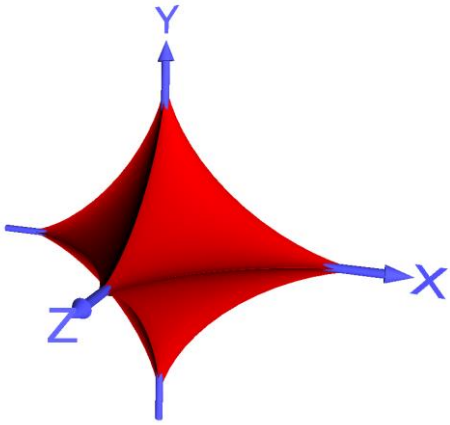


Note

As shown on Shape8 (2), when the sampling resolution is reduced to [40 40], notice lines are form on the shape's curve and the surface of the shape became darker.

In conclusion, the minimum sampling resolution for Shape8 is [50 50].

Q3b

Morphing shape (Start)	Morphing shape (process of morphing)
	
Morphing shape (process of morphing)	Morphing shape (End)
	

Sampling resolution [80 80]
Cycle Interval 5

Name of the file: Q3b.wrl

As shown above are a few screenshots of the morphing animation. The full animation can be seen in Q3b.wrl. The cycle interval is set to 5 is to indicate the 5 seconds morphing animation. Thus, any value higher will slow down the morphing animation and any value lower will speed up the morphing animation. The uniform speed of the swing morphine animation is determined by (1-abs(1-2*t)). Since Shape2 in question 3a required a minimum sampling resolution of [80 80] which is higher than Shape8. Thus, the sampling resolution should follow the larger value of sampling to provide a smooth curve and surface.

In conclusion, the minimum sampling resolution for the morphing shape is [80 80] and cycle interval is 5.