Surfaces of Revolution

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CSEP 557
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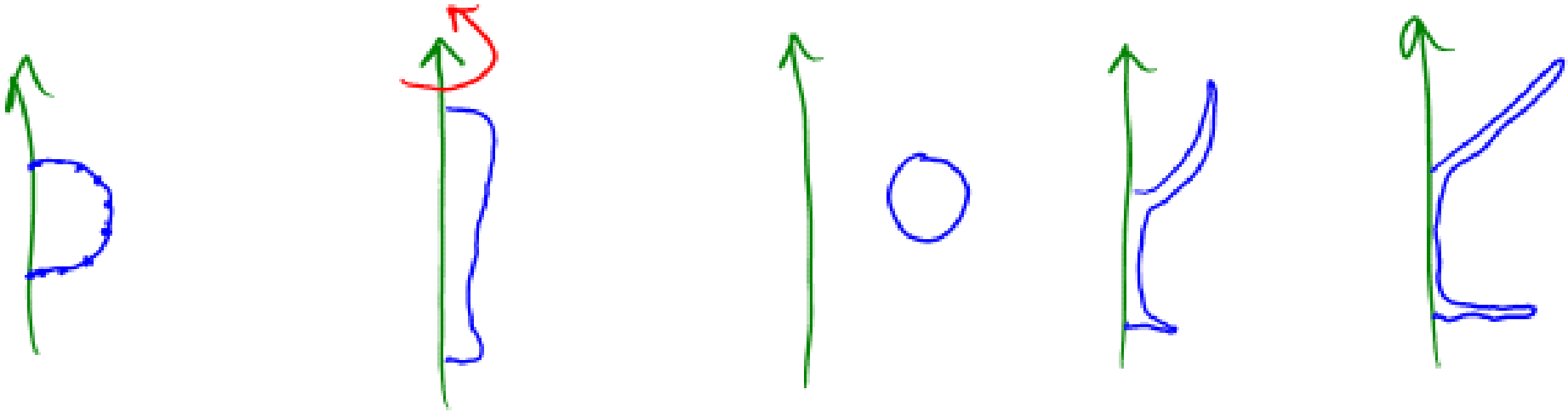
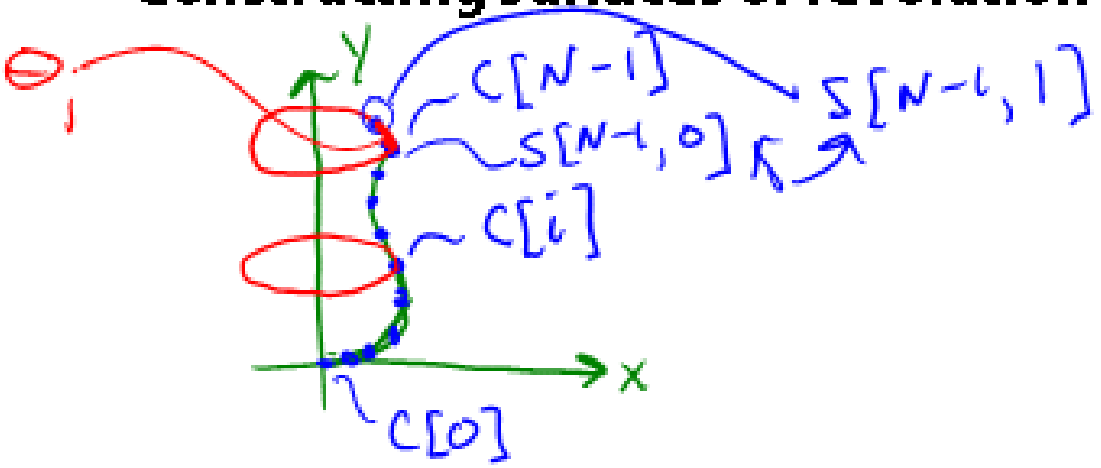
Surfaces of revolution



Idea: rotate a 2D **profile curve** around an axis.

What kinds of shapes can you model this way?

Constructing surfaces of revolution



Given: A set of points $C[i]$ on a curve in the xy-plane:

$$C[i] = \begin{bmatrix} C_x[i] \\ C_y[i] \\ 0 \\ 1 \end{bmatrix} \quad \text{where } i \in [0, N-1]$$

Let $R_y(\theta_j)$ be a rotation about the y-axis by angle θ_j.

Find: A set of points $S[i, j]$ on the surface formed by rotating $C[i]$ rotated about the y-axis. Assume $j \in [0, M-1]$.

$$\Delta\theta_j = \frac{2\pi}{M}$$

$$\theta_j = j\frac{2\pi}{M}$$

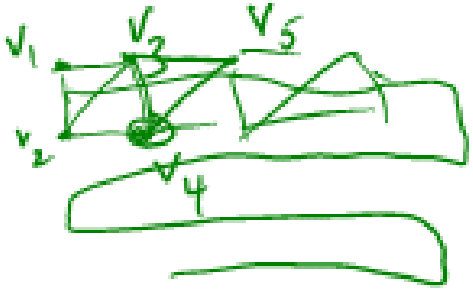
Solution:

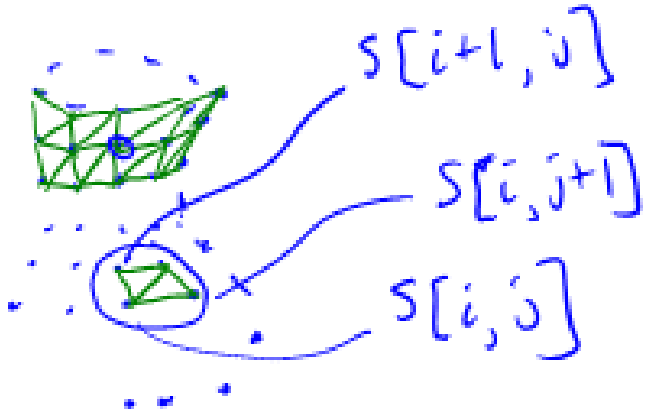
$$S[i,j] = R_y[\theta_j]C[i]$$

$$= R_y\left[j\frac{2\pi}{M}\right]C[i]$$

Constructing surfaces of revolution

We now have an array of points, $S[i, j]$ on the surface.





How would we turn this into a mesh of triangles?

How many triangles are generated? 2MN

How would we send the triangles to the graphics card?

Direct on graphics card as a "shader" program

glDrawElement

glBegin[GL_TRIANGLE_STRIP]
glVertex[E...]