Surfaces of Revolution

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CSE 457
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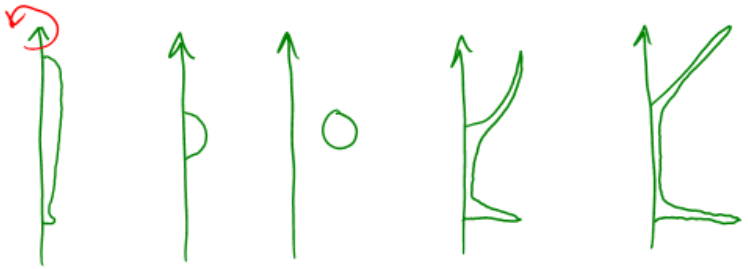
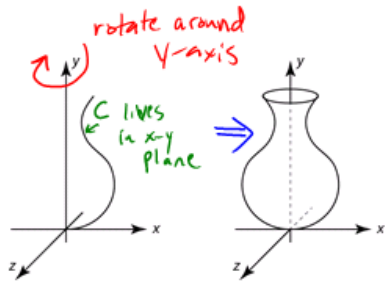
Surfaces of revolution



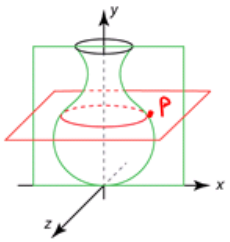
Idea: rotate a 2D **profile curve** around an axis.

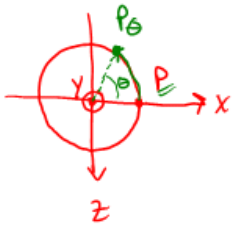
What kinds of shapes can you model this way?

Constructing surfaces of revolution

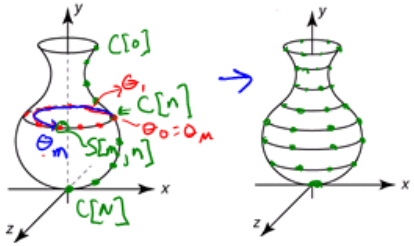


$P_\theta = R_y(\theta)\, P$





Constructing surfaces of revolution



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

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

$\theta_m = \frac{2\pi}{M} \cdot m$

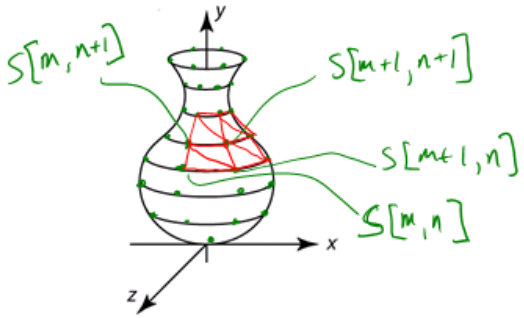
Let $R_y(\theta_m)$ be a rotation about the y-axis by angle θ_m.

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

Solution: $S[m,n] = R_y\left(\frac{2\pi}{M} m\right) C[n]$

Constructing surfaces of revolution

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



How would we turn this into a mesh of triangles?

How many triangles are generated?

$\sim 2N \cdot M$