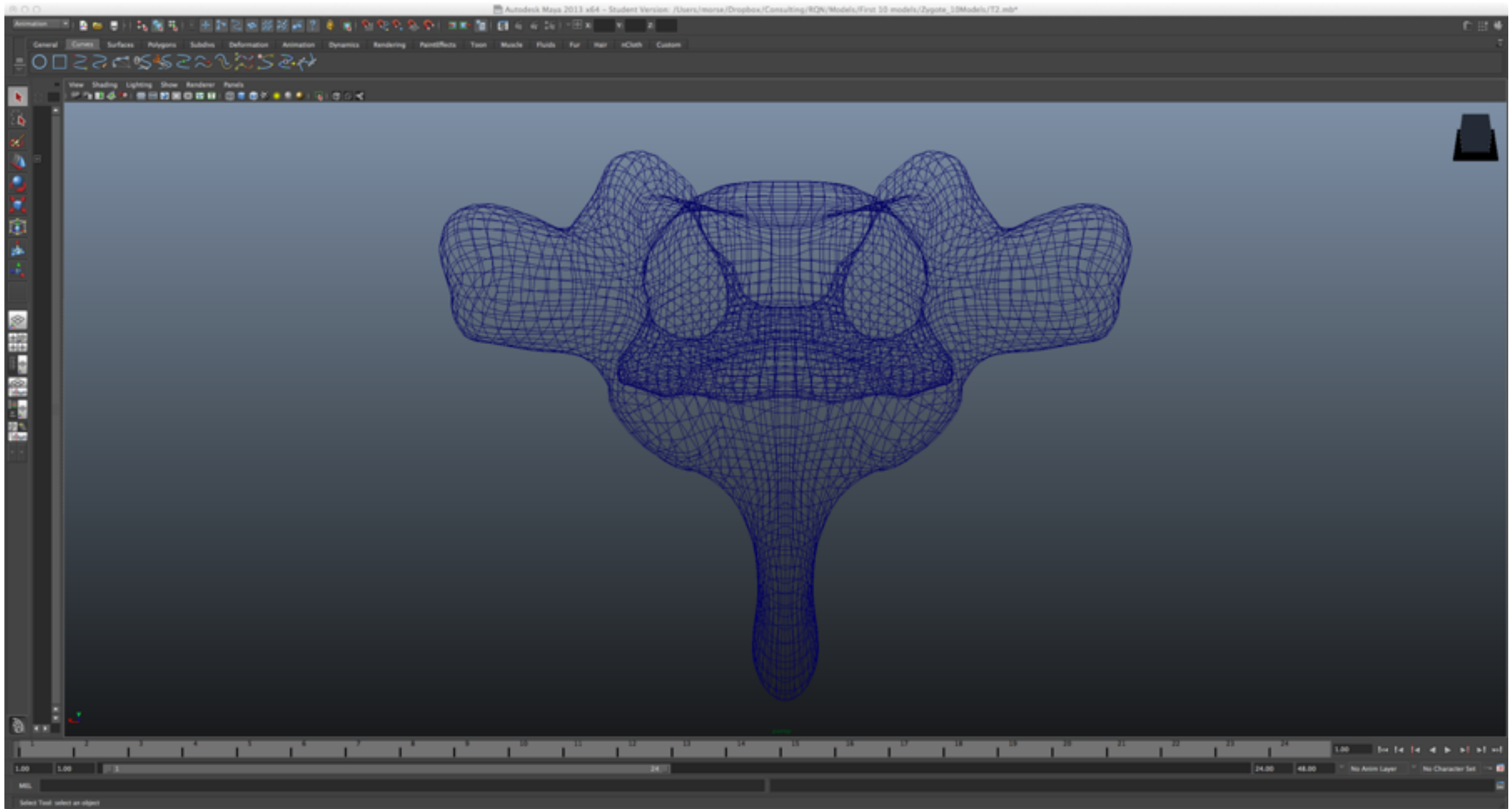




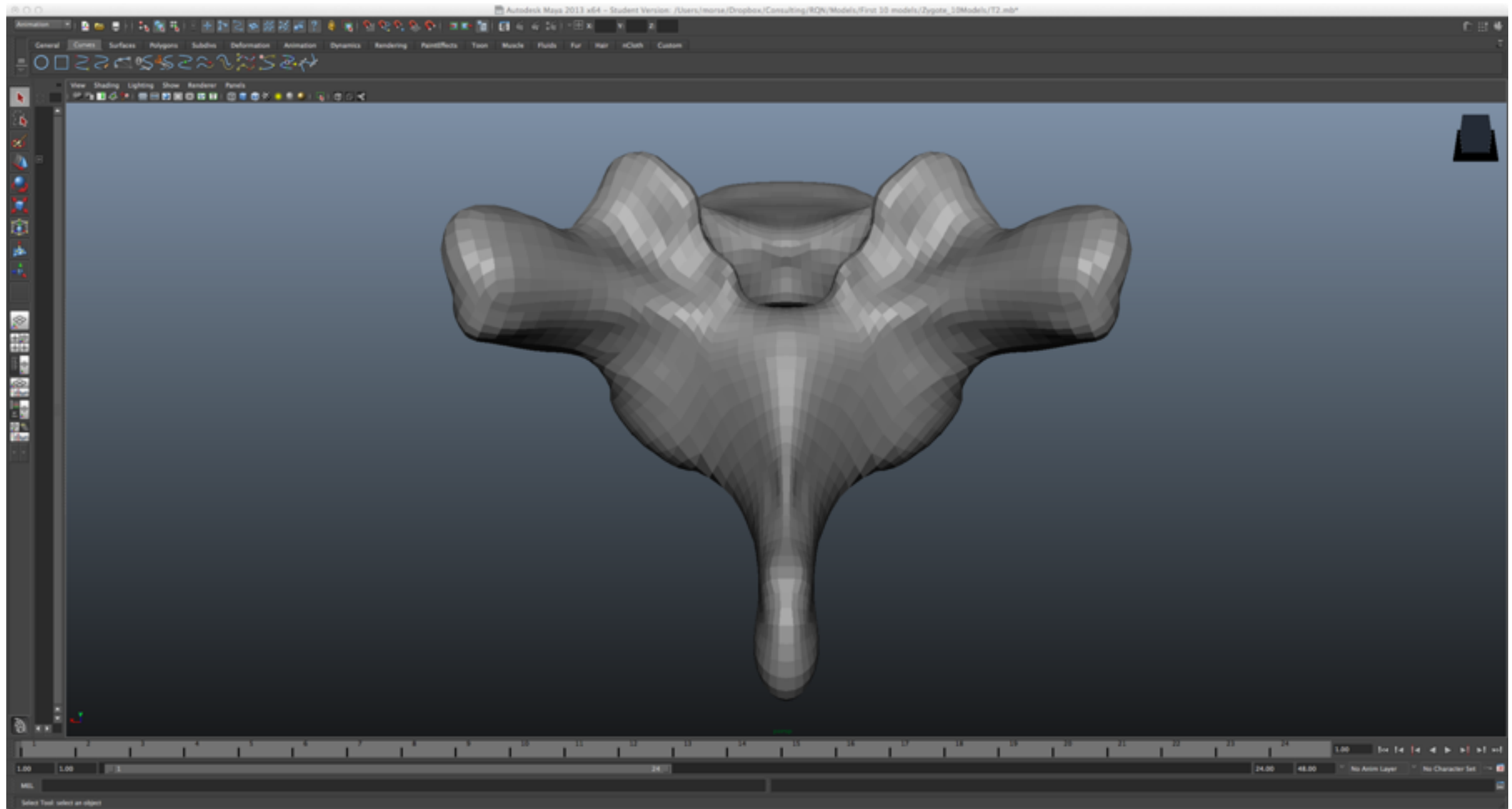
Points, Lines, and Polygons

CS 355: Interactive Graphics and Image Processing

Wireframe Meshes

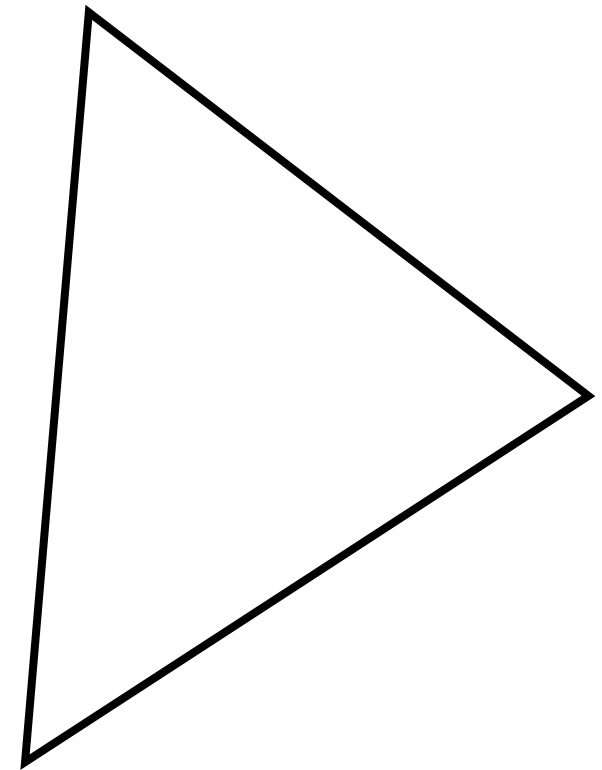


Polygonal Faces



Primitives

- Vertex:
A 3D point (X,Y,Z)
- Edge:
A line connecting two vertices
- Face:
A polygon defined by a set of
“adjacent” (connected by edges) vertices



Storage

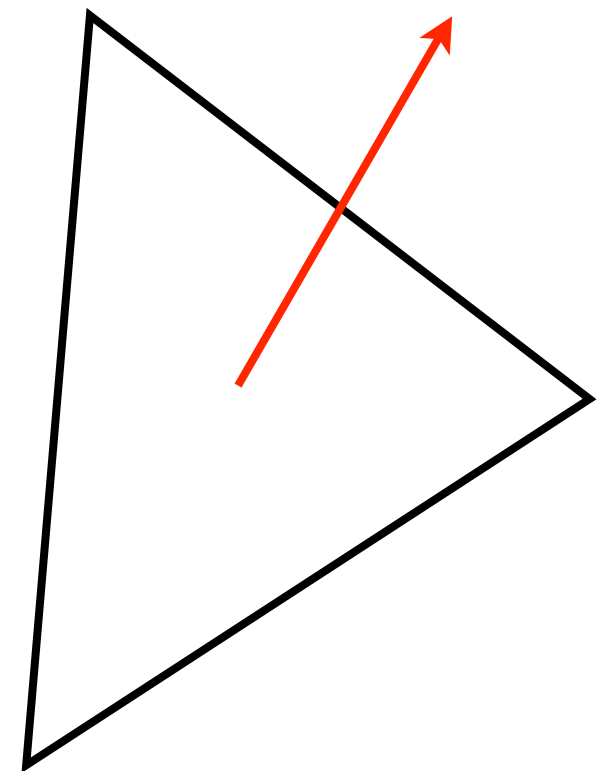
- Common way to store models:
 - List of vertices
 - List of faces bound by vertices (by index)
 - Other information about vertices or faces
- Avoids duplication of redundant data

Storage Example

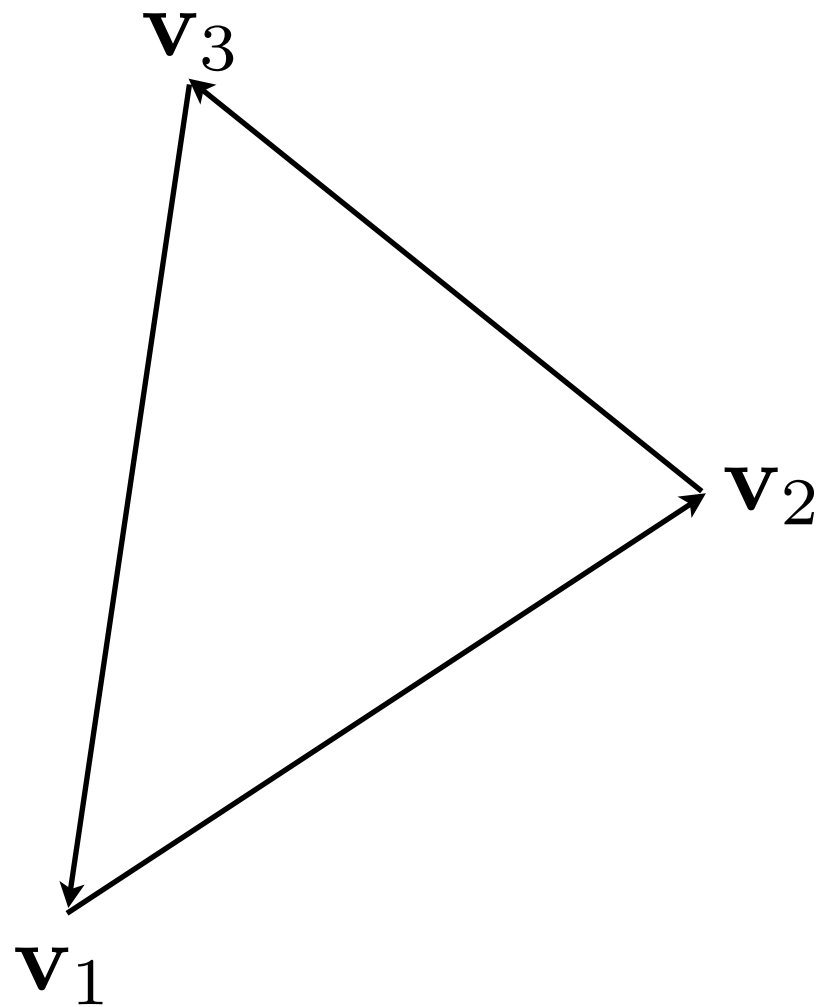
```
# List of Vertices, with (x,y,z[,w]) coordinates,  
# w is optional and defaults to 1.0.  
v 0.123 0.234 0.345 1.0  
v ...  
...  
# Face Definitions (see below)  
f 1 2 3  
f 3 4 5  
f 6 3 7  
f ...  
...
```

Normals

- It's useful to determine the *normal* to the polygonal face
 - Visibility
 - Lighting
 - ...
- Be consistent—usually go with outward facing



Calculating Normals



$$\hat{\mathbf{n}} = \frac{(\mathbf{v}_2 - \mathbf{v}_1) \times (\mathbf{v}_3 - \mathbf{v}_2)}{\|(\mathbf{v}_2 - \mathbf{v}_1) \times (\mathbf{v}_3 - \mathbf{v}_2)\|}$$

Assumes a consistent
winding order

Coming up...

- Visibility testing