

Good Meshes

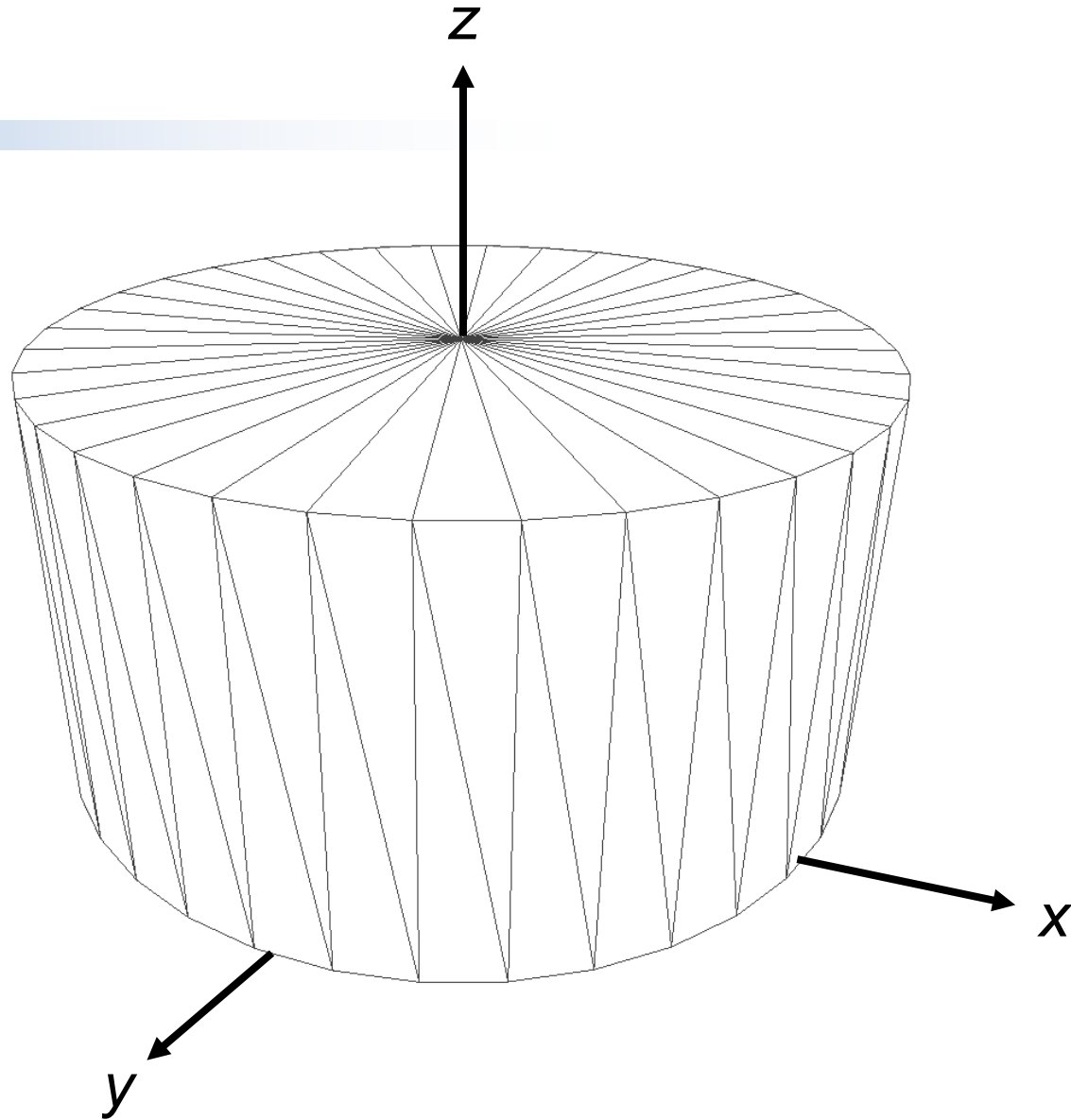
CS418 Interactive Computer Graphics

John C. Hart

Simple Meshes

- Cylinder

$$(x, y, z) = (\cos \theta, \sin \theta, z)$$



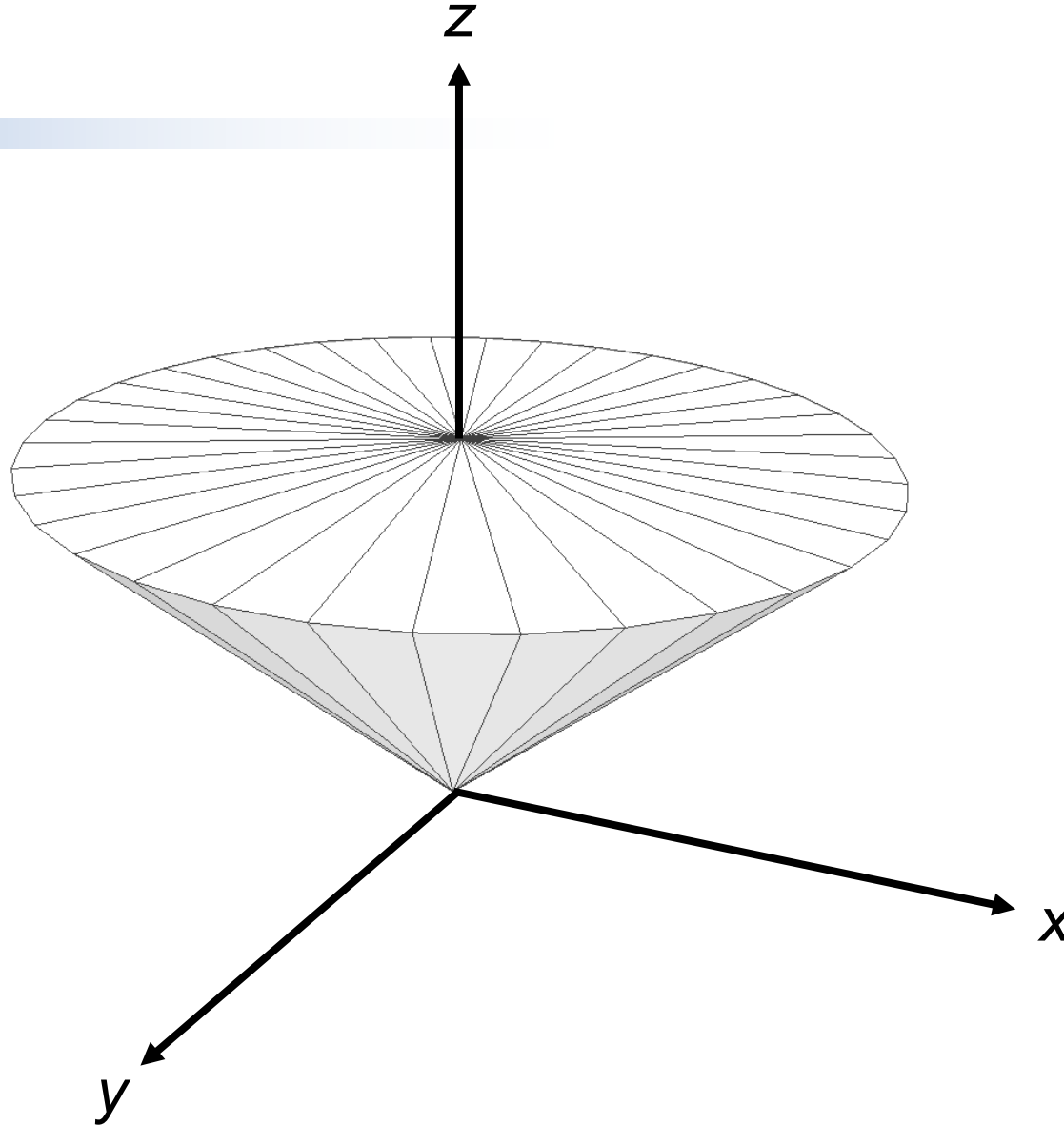
Simple Meshes

- Cylinder

$$(x,y,z) = (\cos \theta, \sin \theta, z)$$

- Cone

$$(x,y,z) = (|z| \cos \theta, |z| \sin \theta, z)$$



Simple Meshes

- Cylinder

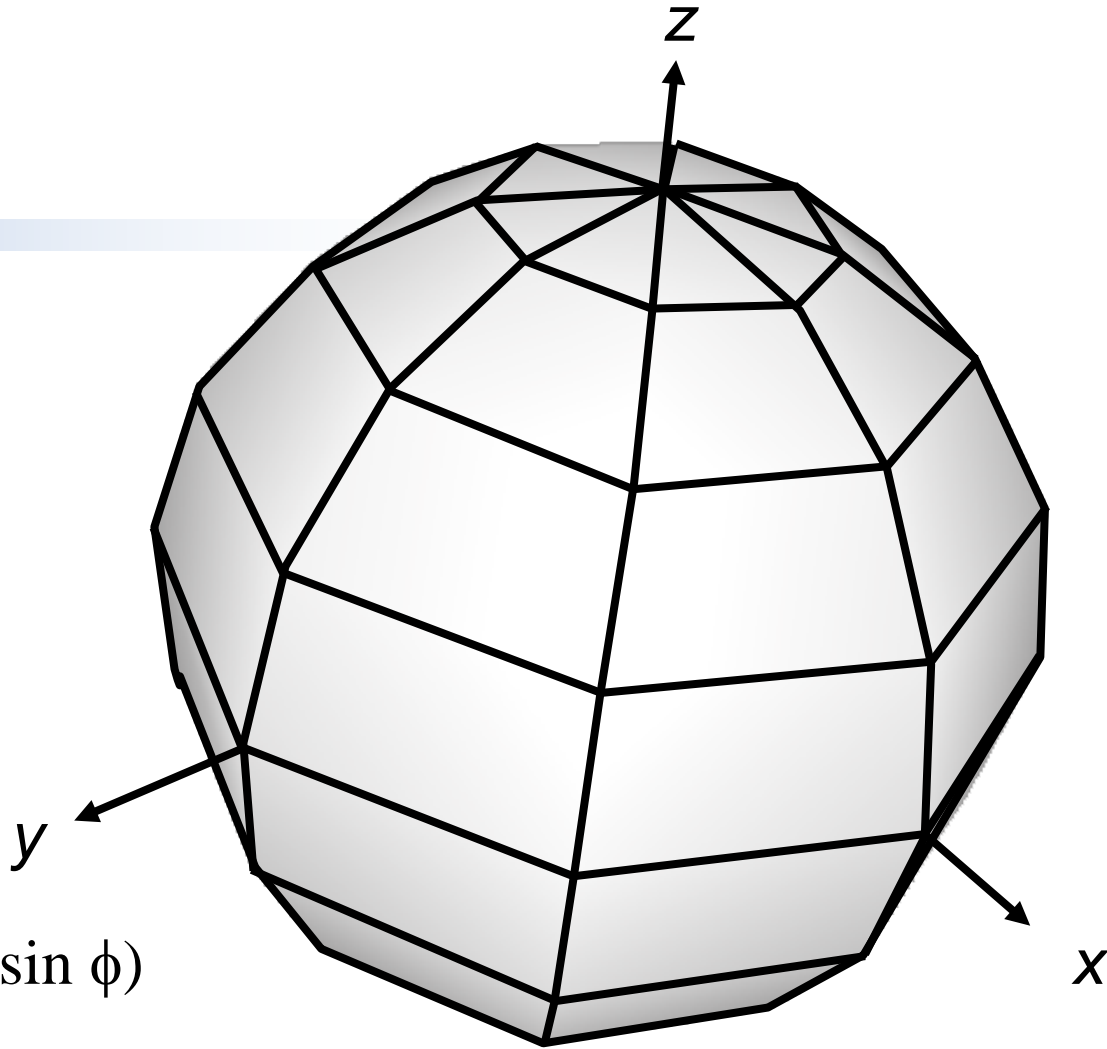
$$(x,y,z) = (\cos \theta, \sin \theta, z)$$

- Cone

$$(x,y,z) = (|z| \cos \theta, |z| \sin \theta, z)$$

- Sphere

$$(x,y,z) = (\cos \phi \cos \theta, \cos \phi \sin \theta, \sin \phi)$$



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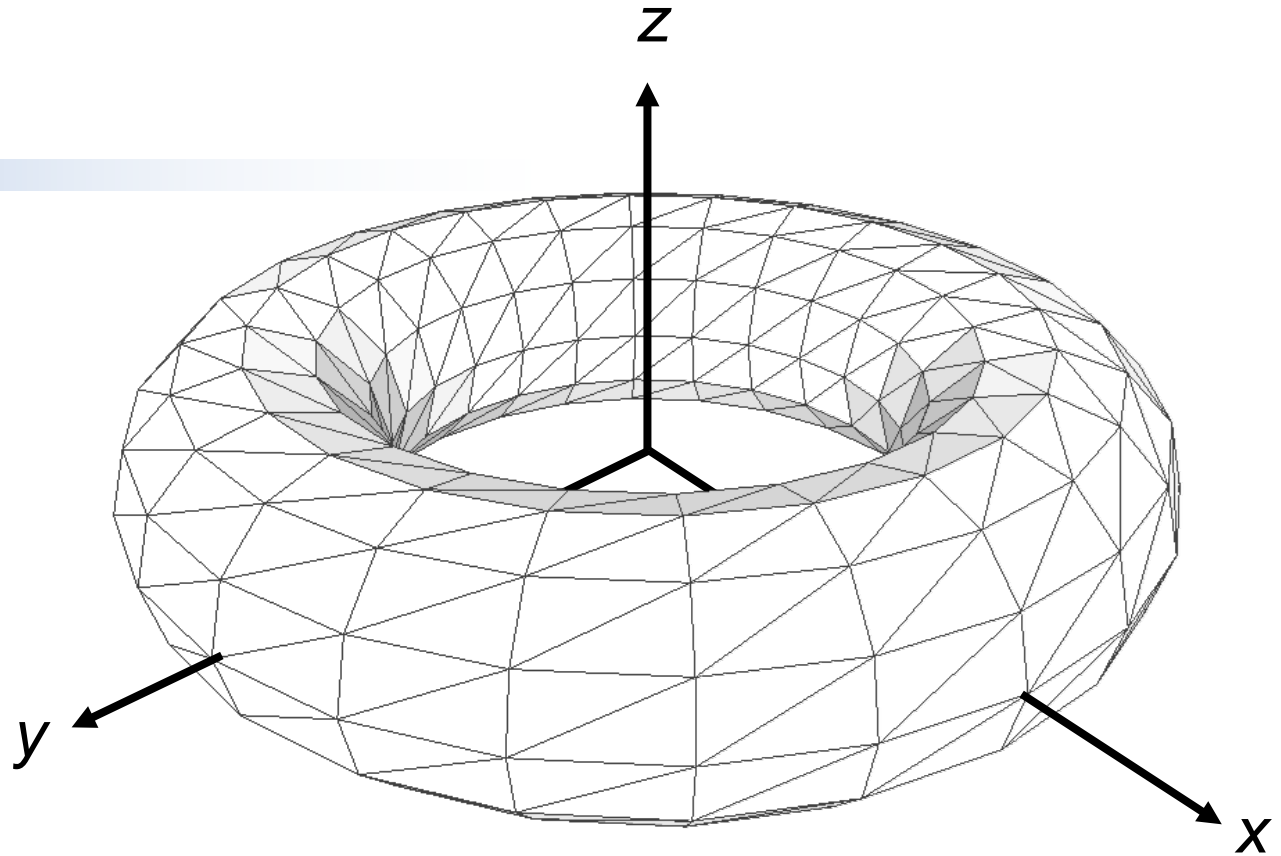
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- Sphere

$$(x,y,z) = (\cos \phi \cos \theta, \cos \phi \sin \theta, \sin \phi)$$

- Torus

$$(x,y,z) = ((R + \cos \phi) \cos \theta, (R + \cos \phi) \sin \theta, \sin \phi)$$

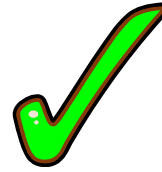
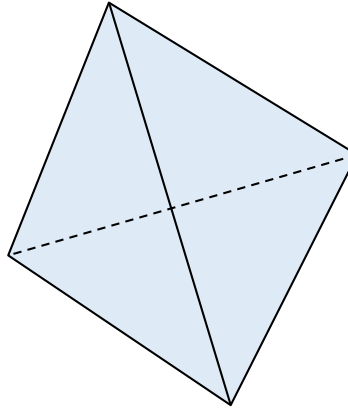


Good Meshes

- **Manifold:**
 1. Every edge connects exactly two faces
 2. Vertex neighborhood is “disk-like”

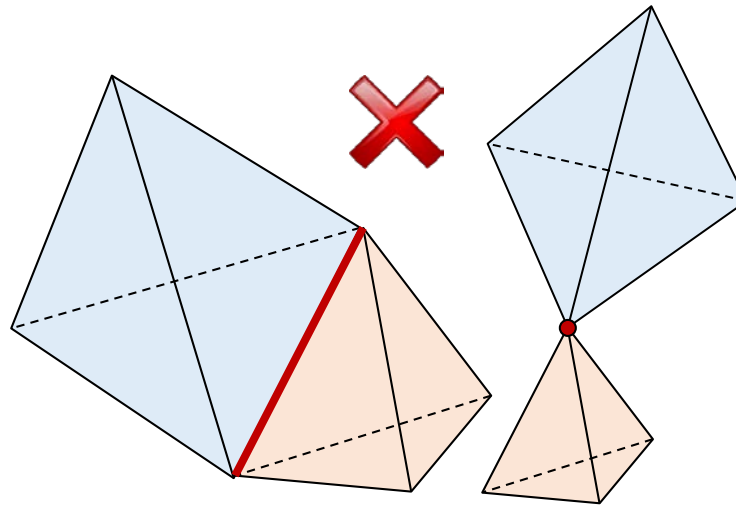
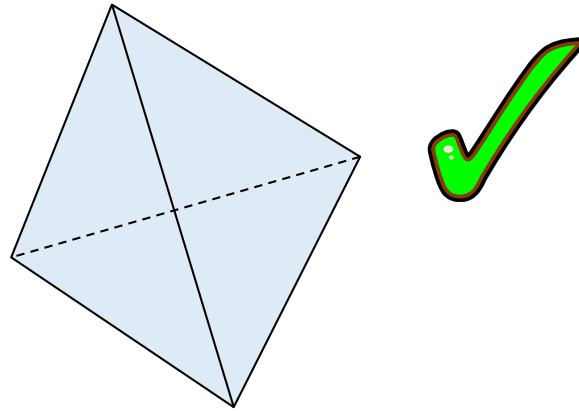
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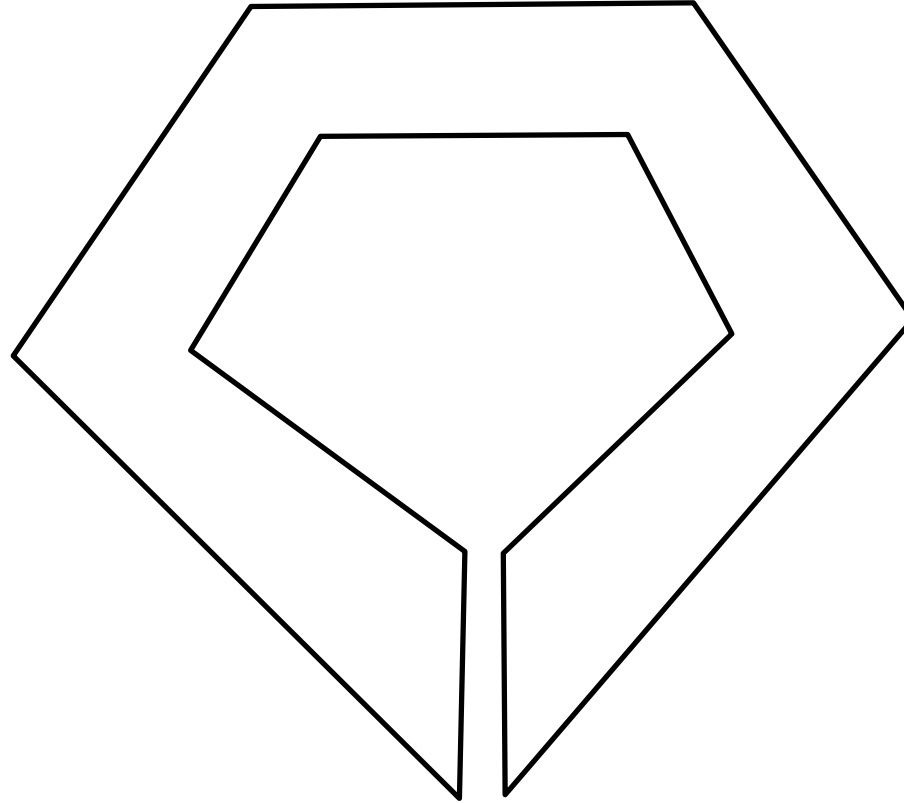
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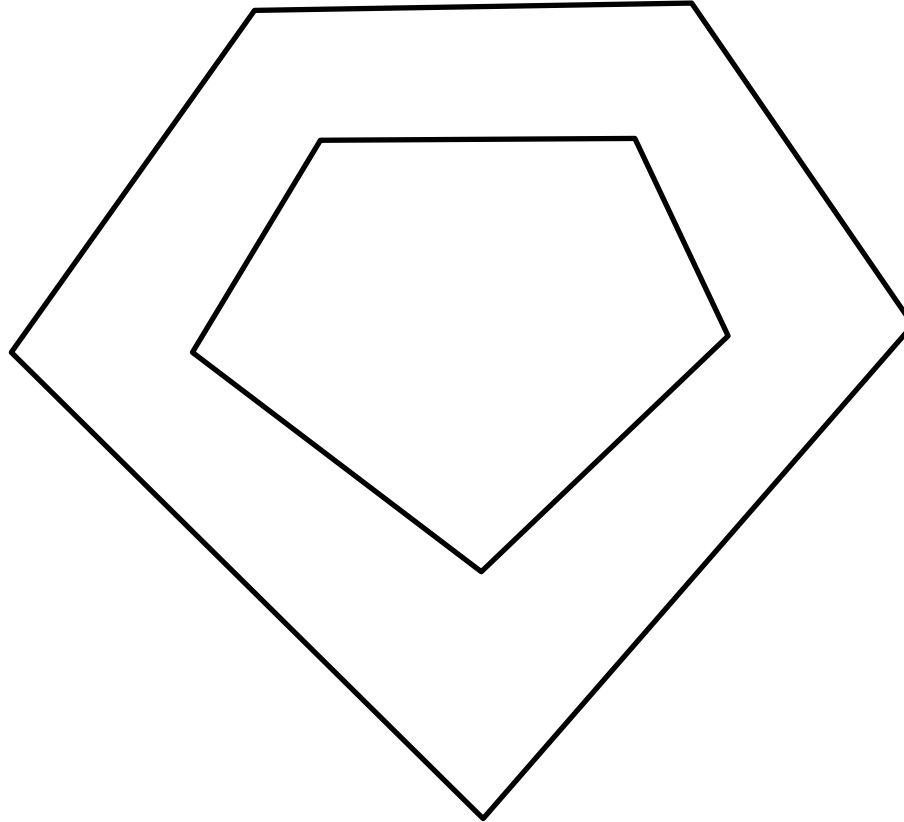
Good Meshes

- **Manifold:**
 1. Every edge connects exactly two faces
 2. Vertex neighborhood is “disk-like”
- **Orientable:** Consistent normals



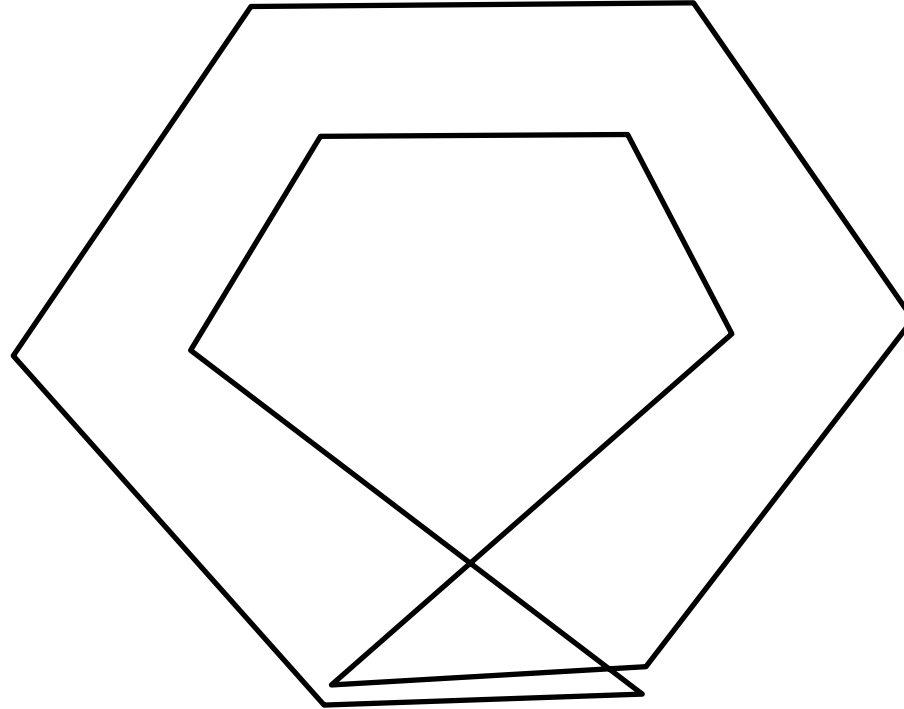
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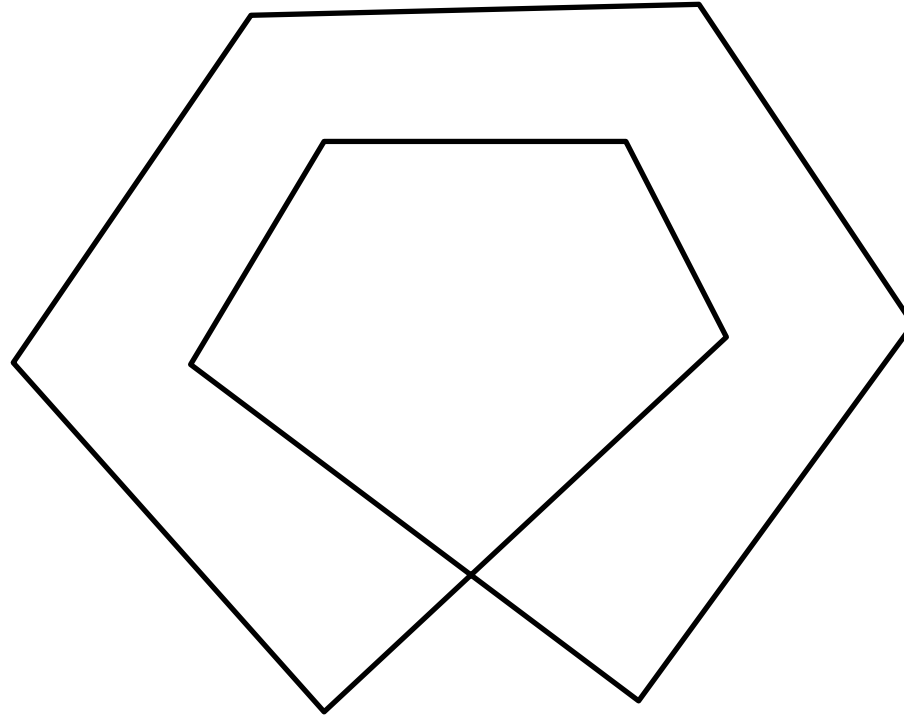
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- **Manifold:**
 1. Every edge connects exactly two faces
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- **Orientable:** Consistent normals
- **Watertight:** Orientable + Manifold



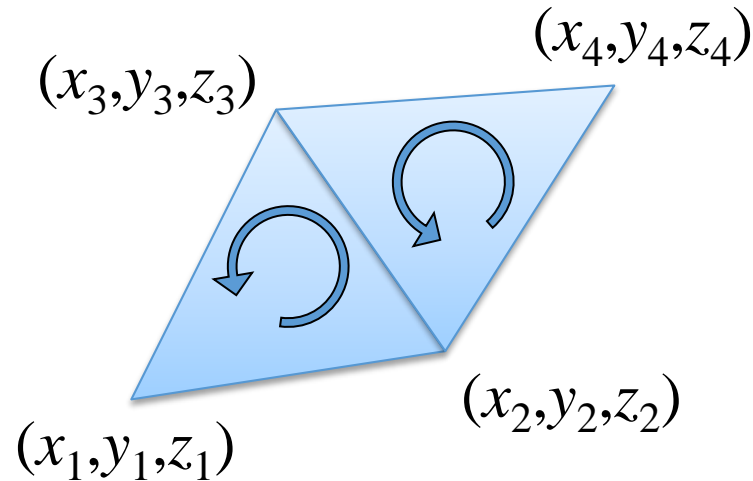
Good Meshes

- **Manifold:**
 1. Every edge connects exactly two faces
 2. Vertex neighborhood is “disk-like”
- **Orientable:** Consistent normals
- **Watertight:** Orientable + Manifold
- **Boundary:** Some edges bound only one face



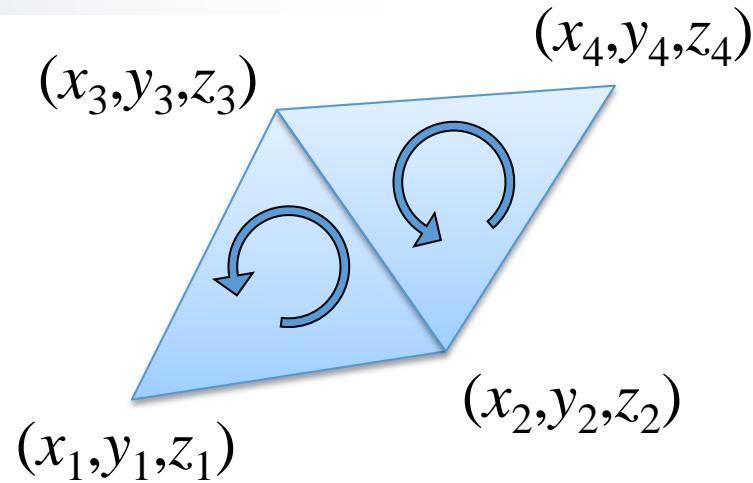
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- **Orientable:** Consistent normals
- **Watertight:** Orientable + Manifold
- **Boundary:** Some edges bound only one face
- **Ordering:** Vertices in CCW order when viewed from normal



Indexed Face Set

- Popular file format
 - VRML, Wavefront “.obj”, etc.
- Ordered list of vertices
 - Prefaced by “v” (Wavefront)
 - Spatial coordinates x,y,z
 - Index given by order
- List of polygons
 - Prefaced by “f” (Wavefront)
 - Ordered list of vertex indices
 - Length = # of sides
 - Orientation given by order



```
v x1 y1 z1
v x2 y2 z2
v x3 y3 z3
v x4 y4 z4

f 1 2 3
f 2 4 3
```