3D Shapes

Basic methods of creating 3D shapes using a 2D sketch:

1. Extruding
   - “Stretching” the shape from its original 2D outline to a 3rd Dimension

2. Revolving
   - Creating a 3D object by drawing a 2D cross-section and revolving that around an axis
Revolving

- 2D Profile
- Extents
  - Full Rotation
  - Degree
- Axis of Rotation:
  - Attached
    - Closed Solid
  - Separated
    - Solid with Hole
Revolve Vs. Extrude

- Revolve Complements Extrusion
  - Some Objects Difficult to Extrude
  - i.e. Cones, wheels
- How would you create this object with extrude?
Positive Revolves

Negative Revolves

Axis of revolution

Sketching plane

Profile

Revolved protrusion

Profile

Sketching plane

Revolved cut

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Acceptable Profiles

Proper

Simple revolved loop profile

Improper

Revolve profile overlapping axis
Options in the Line tool can be chosen to create a construction line that will be used as a revolution axis.
SolidWorks: Closed Profile

Example of a closed profile aligned with the center axis (created by using a construction line)

SolidWorks preview allows the designer to select the correct options
SolidWorks: Hollow Profile

Example of a closed profile separated from the center axis (created by using a construction line)

This example shows how to create a hollow revolve. This is helpful in the creation of wheels, etc.
Revolves Wrap Up

- **Positive Revolve**
  - Make a 3D object
- **Negative Revolve**
  - Remove material from a 3D object
- **Attached Rotation**
  - Will produce a closed object
- **Separated Rotation**
  - Will produce an object with a hole
  - Use construction lines for axes
  - Ensure validity of profile (entire sketch is on one side of revolution axis)

**Homework Assignment**
Create the following shape. Focus on shape and proportionality, not dimensions.

But how do you construct this area? Next slide

On which plane should you start your sketch? Why?
A Suggestion

- Draw vertical line
- Draw center-point circle intersecting end of line
- Draw vertical line intersecting edge of circle
- Use "Trim Entries/Trim to closet"
- Trim 180 degree arc
- Trim 90 degree arc
In-Class Assignment

Draw this wheel using the closed 2D profile shown (from Problem 6.4 (n))

On which plane should you start your sketch? Why?