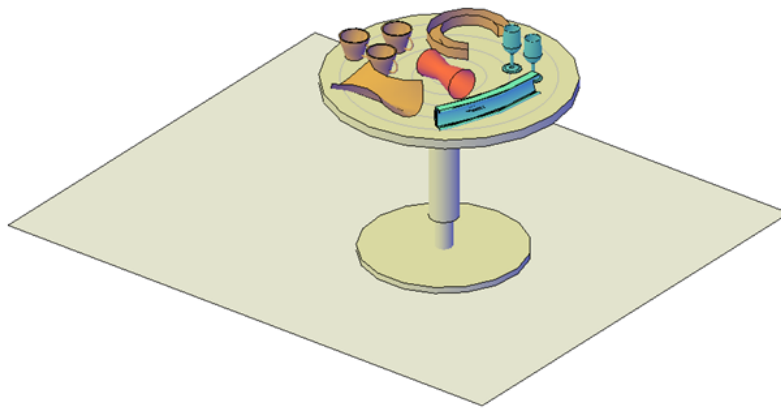


Create 3D Objects from 2D Objects



This tutorial outlines the procedures to create 3D solids and surfaces from 2D objects with solid modeling and editing methods.

Audience: Users new to 3D modeling in AutoCAD 2011

Prerequisites: Working knowledge of 2D drafting

Time to complete: 15 minutes

Objectives

- Loft 2D objects (profiles) to create 3D objects
- Sweep 2D objects (profiles) along a path to create 3D objects

- Revolve 2D objects (profiles) around an axis to create 3D objects

Tutorial Files

All necessary files for this tutorial are located at <http://www.autodesk.com/autocad-tutorials>.

Recommended: Before starting the tutorials

- 1 Download the *create_3DObjects_from_2DObjects.zip* from <http://www.autodesk.com/autocad-tutorials>.
- 2 Unzip *create_3DObjects_from_2DObjects* to *C:\My Documents\Tutorials*.

Before Starting This Tutorial

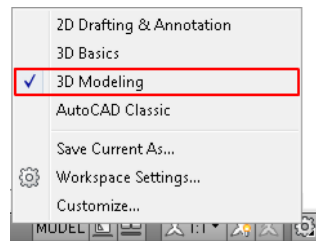
To switch to the 3D Modeling Workspace

- 1 The status bar is located at the bottom of the window. The workspaces icon on the status bar is shown below.



NOTE If you do not see this icon, right-click in an empty area on the status bar and click Workspaces. If you still do not see this icon, you may need to maximize the AutoCAD window.

- 2 Click the down arrow to display the menu of predefined workspaces.



The 3D Modeling workspace is displayed. The Workspaces icon in the status bar indicates that you are now in the 3D Modeling workspace. In this workspace, you can access the various commands and tools needed for creating 3D drawings.

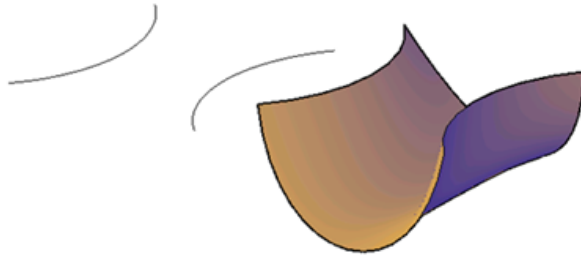
Lesson 1: Loft 2D Objects and Shell a 3D Solid


In this lesson, you create 3D objects from 2D objects by lofting. Then you modify and edit the lofted 3D object by shelling.

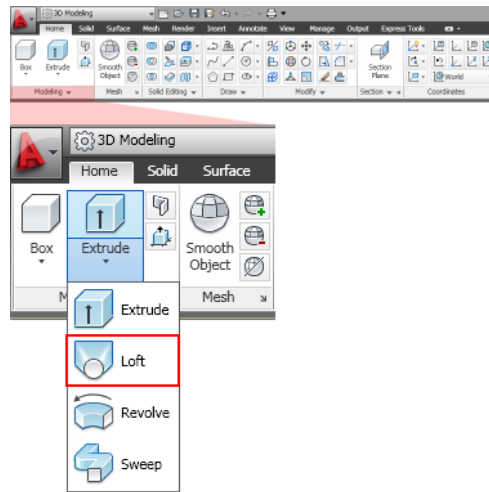
You can create a 3D solid or surface between cross sections (2D profiles) of the object. Lofting creates a solid or surface object that flows through other objects that define its shape.

The cross sections that you use when lofting must be open to create a surface or all closed to create a solid. You cannot use a selection set that includes both open and closed objects.

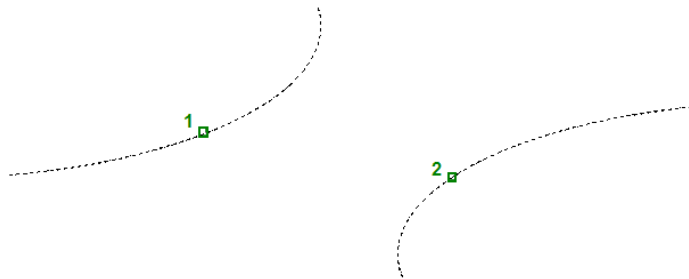
To create a surface by lofting a 2D open object (arc)



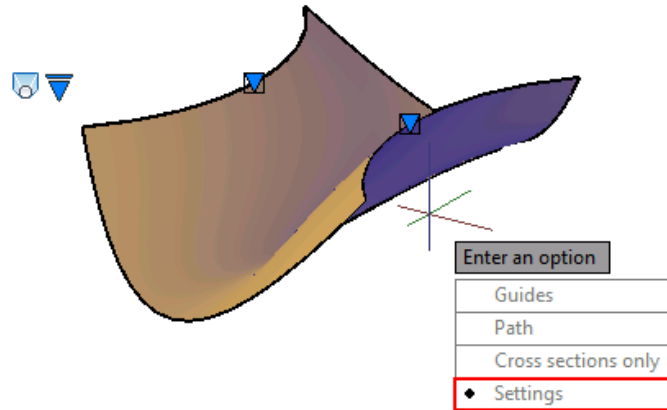
- 1 Click  ➤ Open.
- 2 In the Select File dialog box, browse to *C:\My Documents\Tutorials* and select *sheet.dwg*.
- 3 Click Open.
- 4 On the ribbon, click Home tab ➤ Modeling panel ➤ Solid Creation drop-down ➤ Loft.



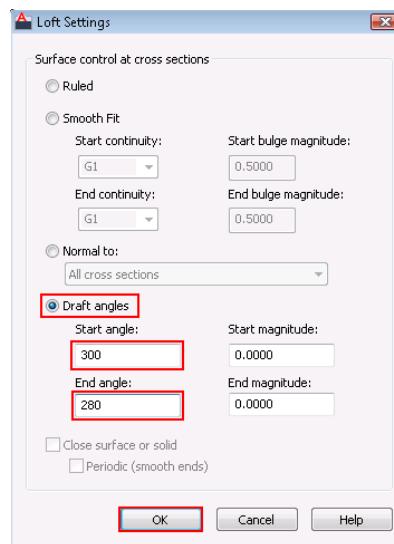
5 Select the two arcs in the drawing and press Enter.



6 At the prompt, enter S for Settings and press Enter.




- 7 In the Loft Settings dialog box, under Surface Control At Cross Sections, select Draft Angles.
- 8 In the Start Angle and End Angle boxes, enter **300** and **280** respectively.



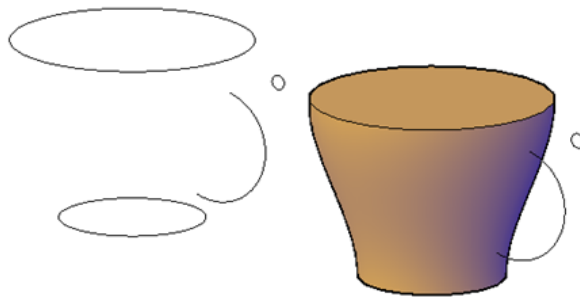
- 9 Click OK.
You have created a surface object that represents a sheet.
- 10 On the ViewCube, located at the upper-right corner of the drawing window, click Top and Front to navigate around the sheet.





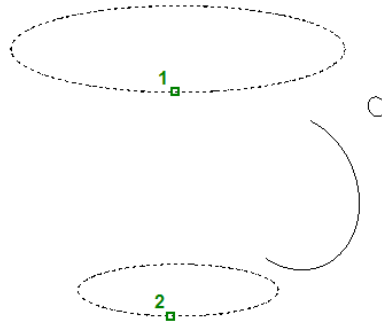
NOTE For more information on ViewCube, see the *AutoCAD User's Guide* or refer to the AutoCAD 2009 tutorial: [Navigating a model with ViewCube](#).

- 11 To close the drawing without saving, click  ➤ Close.

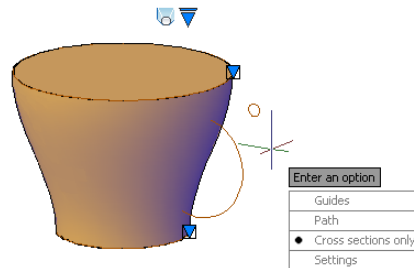
To create a cup by lofting 2D closed objects (circles)




- 1 Click  ➤ Open.
- 2 In the Select File dialog box, browse to *C:/My Documents/Tutorials* and select *create_cup.dwg*.
- 3 Click Open.
- 4 On the ribbon, click Home tab ➤ Modeling panel ➤ Solid Creation drop-down ➤ Loft. 
- 5 Select the two largest circles as shown in the drawing and press Enter.

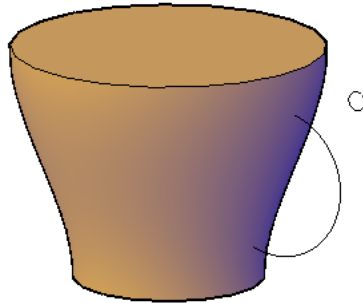


- 6 At the prompt, enter **C** for Cross sections only and press Enter.



- 7 On the ViewCube, located at the upper-right corner of the drawing window, click Top, Front, and Right to navigate around the 3D solid object.

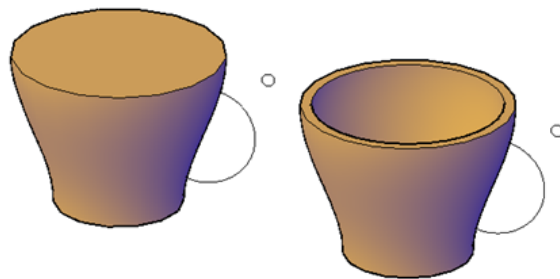
- 8 Click  ► Save to keep your changes.



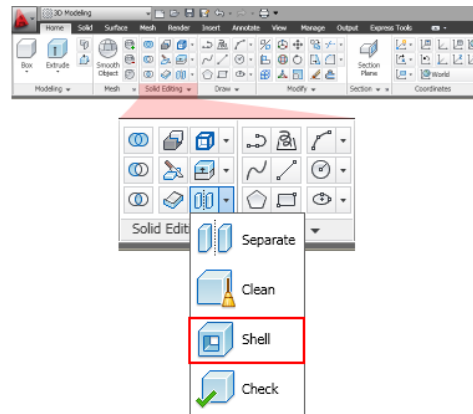
To edit the cup by shelling to create a hollow

You can shell a 3D solid object using the SOLIDEDIT command. When you shell a 3D solid object, new faces are created by offsetting existing faces inside or outside from their original positions.

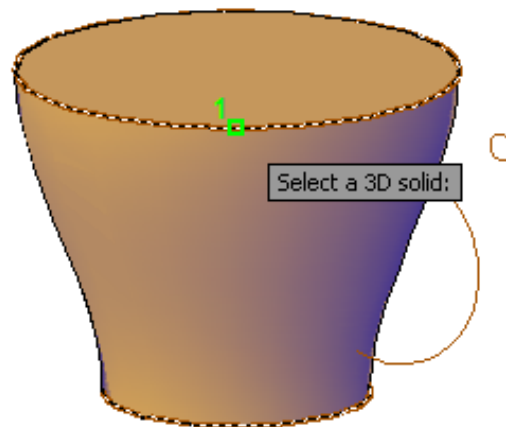
Using the *create_cup.dwg* from the previous lesson, you will hollow the cup by shelling the lofted 3D solid object you created.



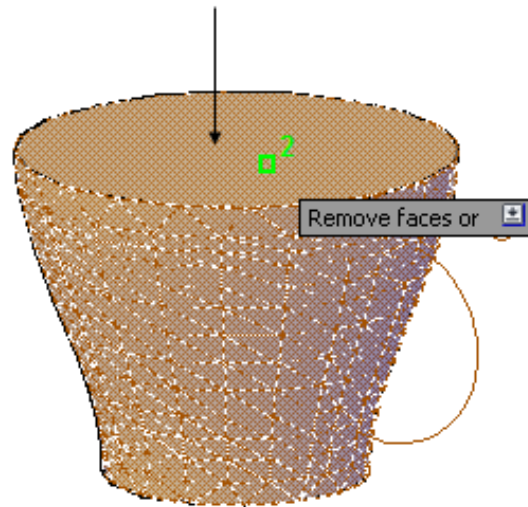
- 1 On the ribbon, click Home tab ► Solid Editing panel ► Solid Editing drop-down ► Shell.



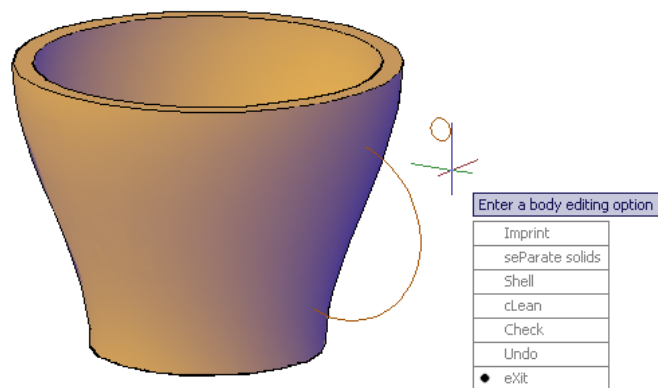
2 Select the lofted 3D solid object.



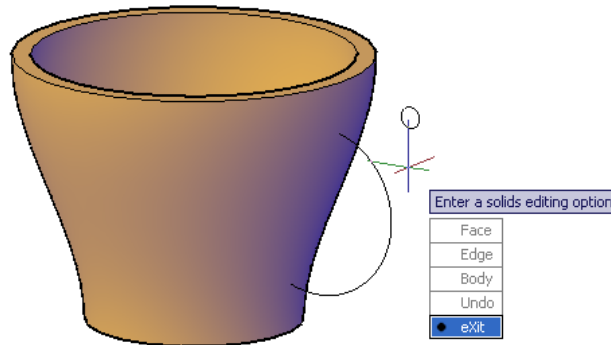
3 Select the top face of the 3D solid and press Enter.



- 4 At the prompt, enter **0.5** as the shell offset distance. Press Enter.
- 5 At the prompt, enter **X** to exit the body editing option.



- 6 At the prompt, enter **X** to exit the solids editing option.



You have shelled the 3D solid to create a hollow cup.

- 7 Select the 3D solid object.
- 8 At the Command prompt, enter **facetres** and press Enter. This system variable controls the smoothness of 3D solids.
- 9 At the prompt, enter **10** as the FACETRES value.
- 10 On the ViewCube, located at the upper-right corner of the drawing window, click Top, Front, Right, and Left to navigate around the hollow cup.

Summary: In this lesson, you learned to

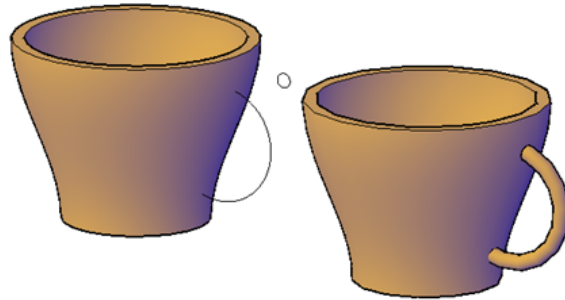
- Loft open and closed 2D objects to create a 3D surface and a 3D solid
- Shell a 3D solid object

Lesson 2: Sweep 2D Objects Along a Path

In this lesson, you create 3D objects by sweeping 2D objects along a path.

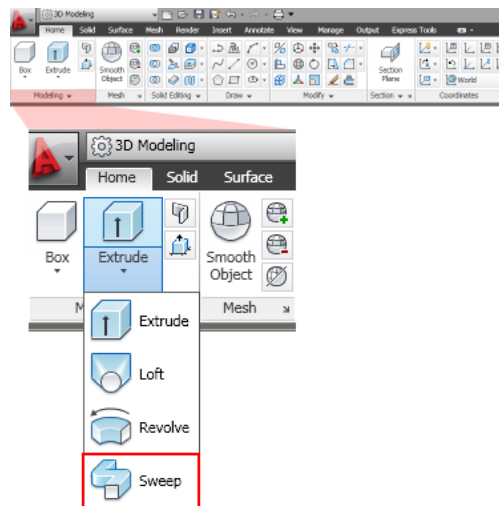
You can create a 3D solid or surface by sweeping a 2D or 3D object, also known as a *profile*, along a path. You can sweep more than one profile at a time, but they all must lie on the same plane.

To create a handle by sweeping a circle along a path

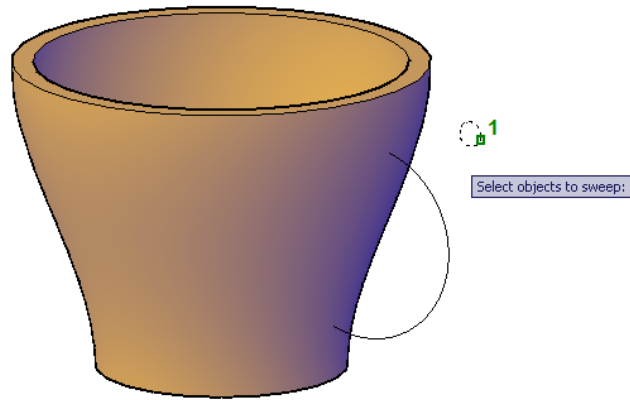


Using the same drawing file that you used in the previous tutorial, *create_cup.dwg*, you will sweep a circle along a path to create the handle of the cup.

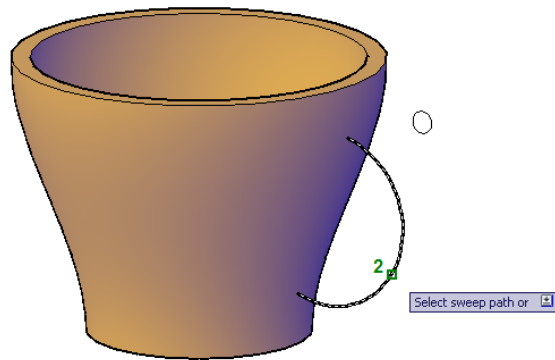
- 1 At the Command prompt, enter **delobj**.
- 2 At the prompt, enter **1** to delete profile curves and remove all defining geometry.
- 3 On the ribbon, click Home tab ► Modeling panel ► Solid Creation drop-down ► Sweep.



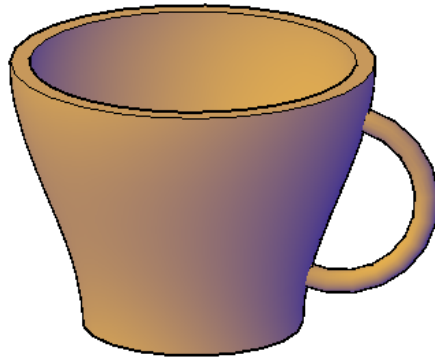
- 4 Select the circle and press Enter.



5 Select the arc to specify the sweep path.





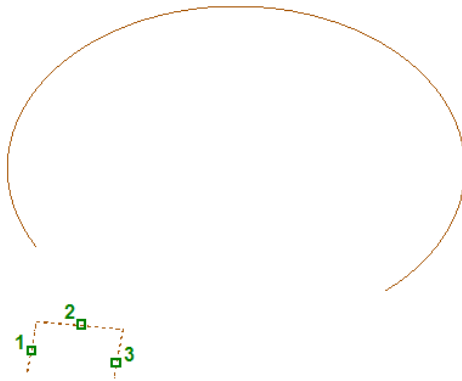
You have created a handle for the cup.



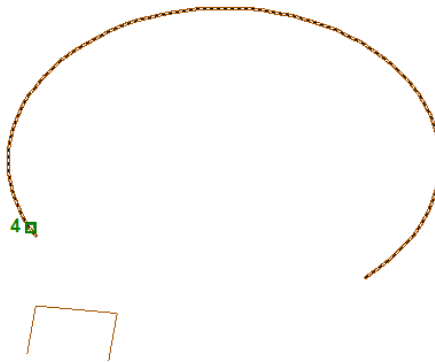
- 6 Click  ► Save.

To create a surface by sweeping

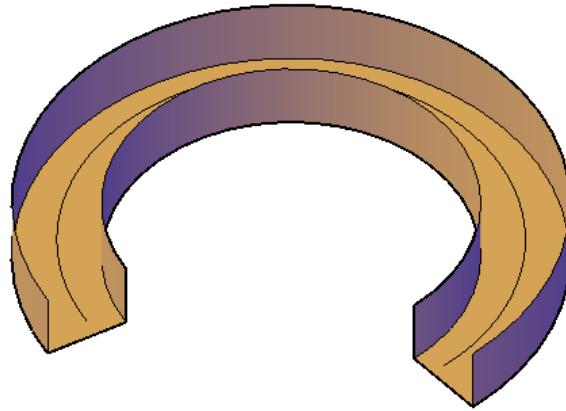
- 1 Click  ► Open.
- 2 In the Select File dialog box, browse to *C:/My Documents/Tutorials* and select *mold.dwg*.
- 3 Click Open.
- 4 On the ribbon, click Home tab ► Modeling panel ► Solid Creation drop-down ► Sweep. 
- 5 Click the three lines as shown in the illustration and press Enter.



6 Select the arc to specify the sweep path.



You have created the surface of a mold.



Summary: In this lesson, you learned how to sweep open and closed 2D objects along a path to create 3D surfaces and solids.


Lesson 3: Revolve 2D Objects Around an Axis

In this lesson, you revolve 2D objects around an axis to create 3D solids and surfaces.

A 3D solid or surface can be created by revolving a closed or open planar curve about an axis at a specified angle. Objects that can be revolved are 2D solids, 3D faces, arcs, circles, ellipses, elliptical arcs, lines, 2D polylines, regions, 3D solids faces, 2D splines, 3D surfaces-planar faces, and traces.

NOTE While revolving a wide polyline, the width of a polyline is ignored and the revolution takes place from the center of the polyline. Polylines that have crossing or self-intersecting segments cannot be revolved.

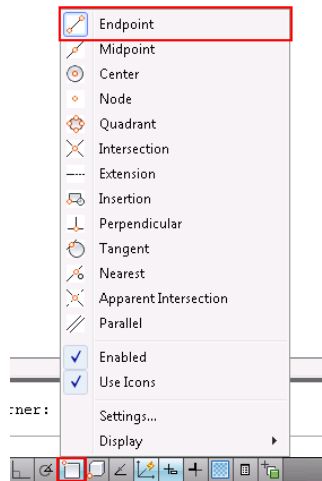
To create a 3D solid model by revolving

- 1 Click  ➤ Open.
- 2 In the Select File dialog box, browse to *C:/My Documents/Tutorials* and select *rim.dwg*.
- 3 Click Open.

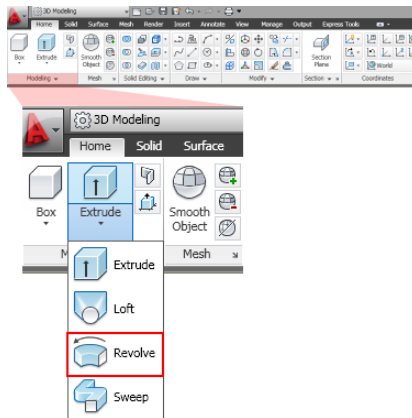
- 4 On the status bar, click the Object Snap button to enable object snap mode.



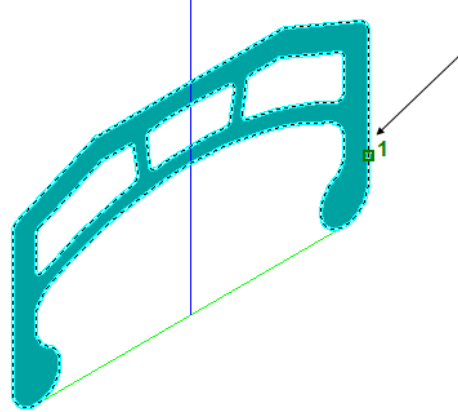
- 5 Right-click the Object Snap button and click Endpoint to turn it on. The Endpoint option should now have a box around its icon which indicates the object snap is enabled.



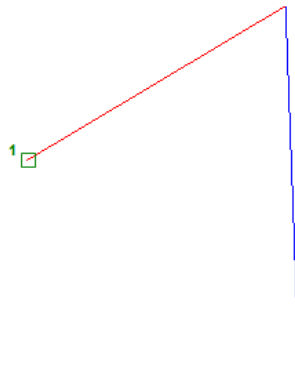
- 6 On the ribbon, click Home tab ► Modeling panel ► Solid Creation drop-down ► Revolve.



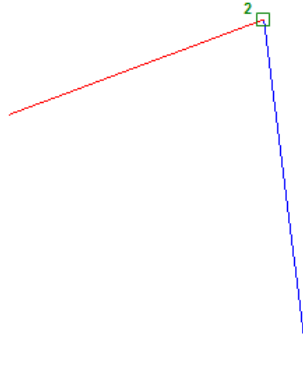
- 7 Select the object shown in the illustration and press Enter.



- 8 Select the endpoint of the red line as shown in the illustration to specify the axis start point.

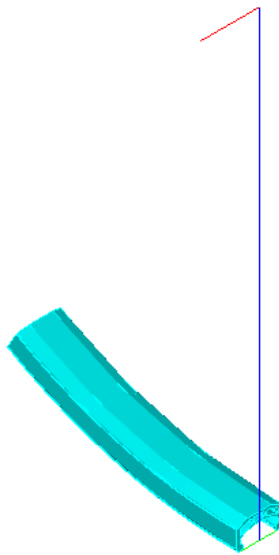


- 9 Select the other endpoint of the red line to specify the axis endpoint.

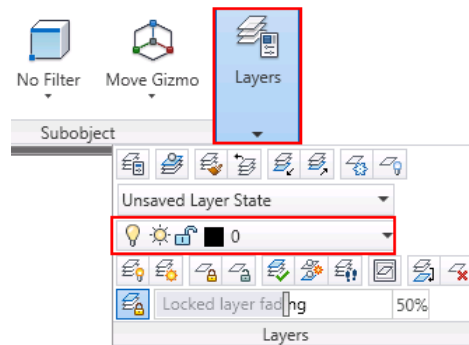


NOTE The red line will be used as the axis of revolution.

- 10** At the prompt, enter **30** as the angle of revolution. Press Enter.

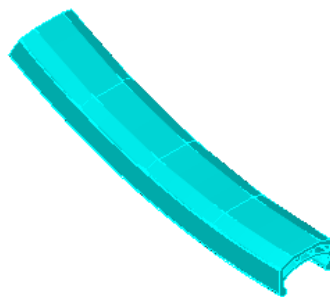


- 11** On the ribbon, click Home tab ➤ Layers panel ➤ Layer drop-down list.

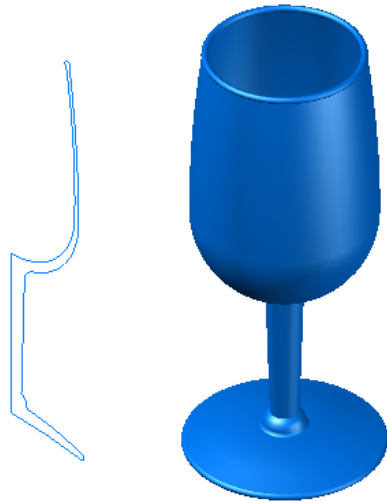




12 Select 00 REFERENCE layer and click the bulb icon to turn it off.

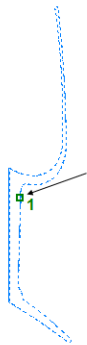
You have revolved the 2D object around its axis to create a rim.



To revolve an object around an internal point to create a glass



- 1 Click  ➤ Open.
- 2 In the Select File dialog box, browse to *C:/My Documents/Tutorials* and select *glass.dwg*.
- 3 Click Open.
- 4 On the ribbon, click Home tab ➤ Modeling panel ➤ Solid Creation drop-down ➤ Revolve. 
- 5 Select the object as shown in the illustration and press Enter.



- 6 Select the bottom endpoint of the glass step as shown in the illustration to specify the axis start point.

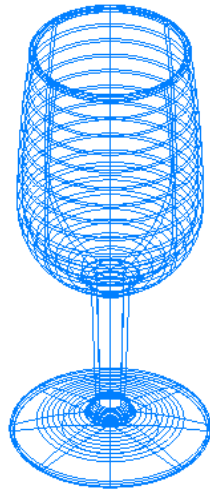


- 7 Select the top endpoint of the glass step as shown in the illustration to specify the axis endpoint.

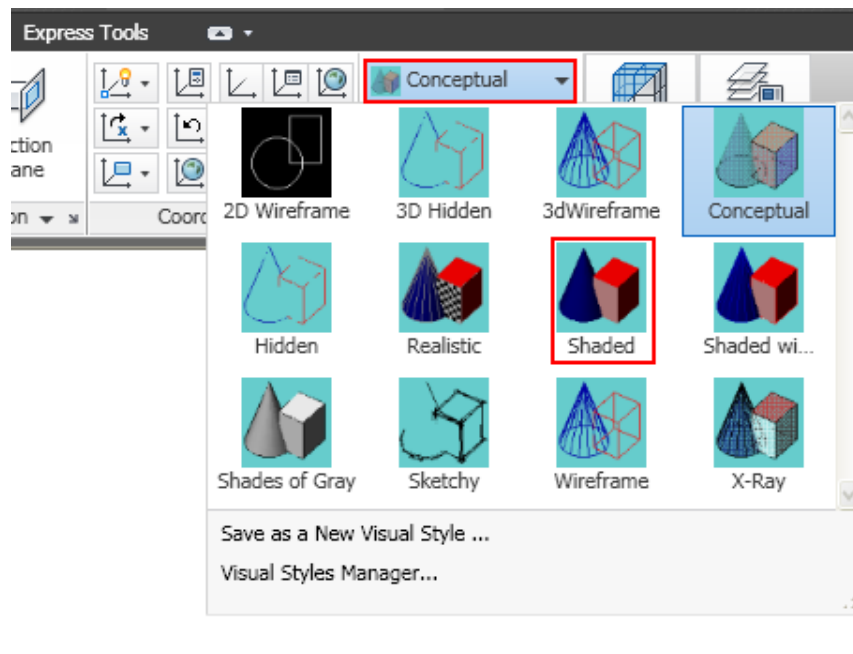


- 8 At the prompt, enter **360** as the angle of revolution.

You have created a glass.






- 9 On the ribbon, click Home tab ► View panel ► Visual Styles drop-down list.
- 10 Select the Shaded visual style to give the glass a smooth and realistic appearance.

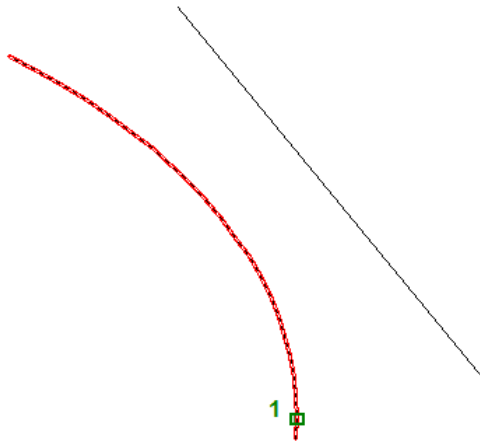


The object is displayed with smooth shading.

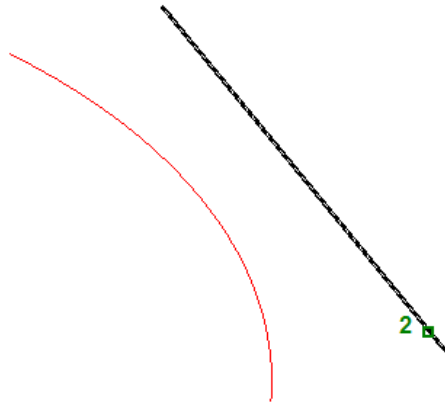


To create a 3D surface by revolving

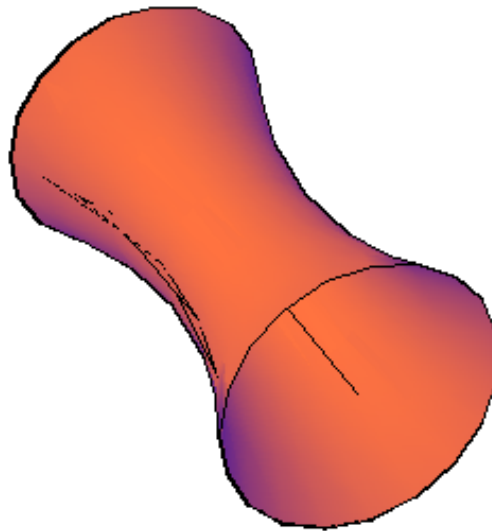
- 1 Click  ► Open
- 2 In the Select File dialog box, browse to *C:/My Documents/Tutorials* and select *vessel.dwg*.
- 3 Click Open.
- 4 On the status bar, click Ortho Mode to restrict cursor movements to a horizontal or vertical axis.

- 5 On the ribbon, click Home tab ► Modeling panel ► Solid Creation drop-down ► Revolve. 
- 6 Select the arc and press Enter.



- 7 At the prompt, enter **O** for Object and press Enter.
- 8 Select the line as the object.



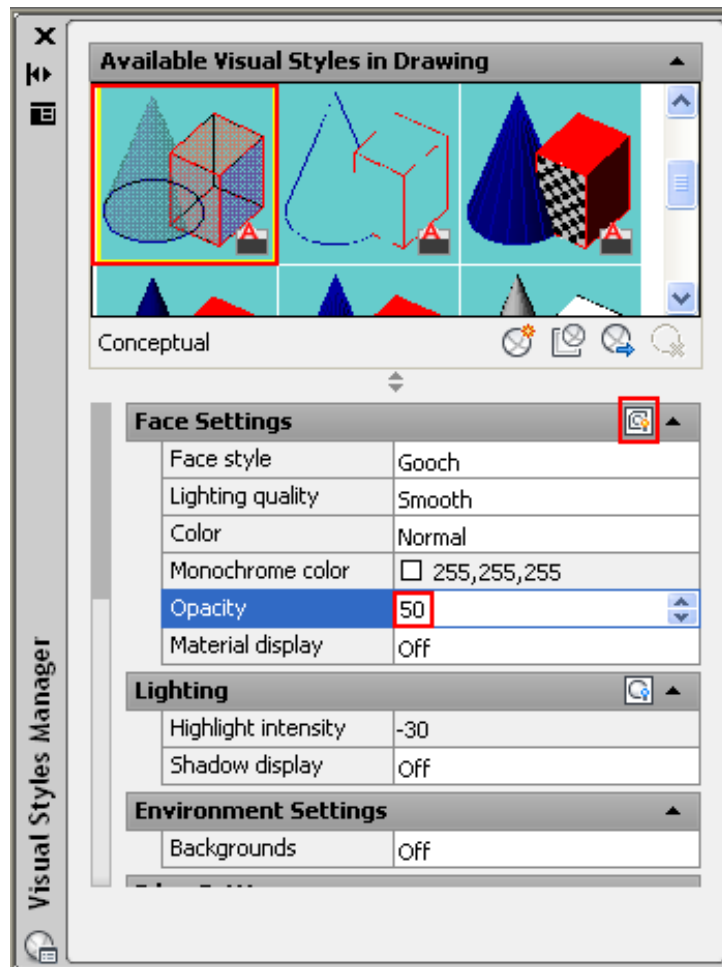
- 9 At the prompt, enter **360** as the angle of revolution and press Enter.



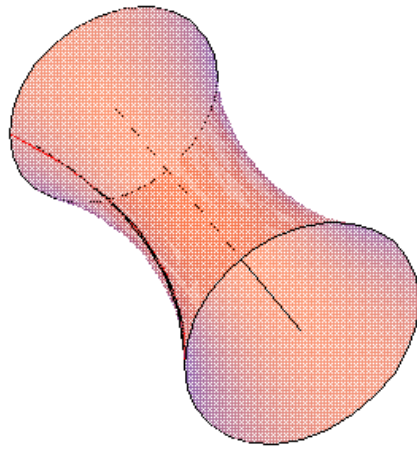
You have created a 3D surface that represents an open surface

- 10 At the Command prompt, enter **visualstyles**.
- 11 On the Visual Styles Manager palette, under Available Visual Styles In Drawing, select Conceptual.

- 12 Under Face Settings , click the Opacity button to change the current value.
- 13 Enter 50.



The vessel is now transparent.



- 14** On the ViewCube located at the upper-right corner of the drawing window, click Top, Front, Right, and Left to navigate around the vessel.

Summary: In this lesson, you learned how to create 3D solid and surface objects by revolving open and closed 2D objects around an axis.

Congratulations! You have created 3D objects from 2D objects (profiles).

For more information, see the *AutoCAD User's Guide*.