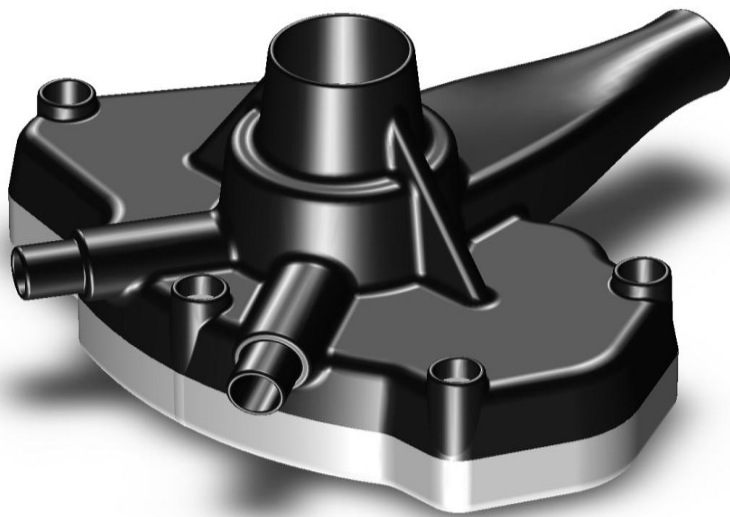


SolidWorks 2010

Part II - Advanced Techniques



Advanced Level Tutorials

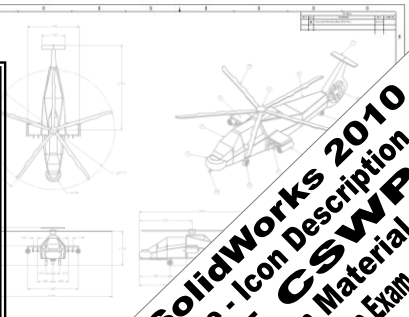
Parts, Surfaces, SimulationXpress, Sheet Metal,
Top-Down Assemblies, Core & Cavity Molds

Paul Tran, CSWP, CSWI
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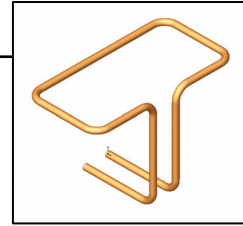
FREE SolidWorks 2010
QuickGuide - Icon Description
FREE CSWP
Preparation Material
For The CSWP Core Exam



CHAPTER 1








Introduction To 3D Sketch

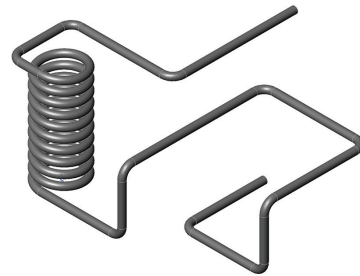
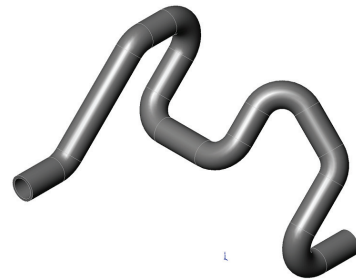
3-D Sketch Advanced Topics



Using SolidWorks enables you to create 3D sketches. A 3D sketch consists of lines and arcs in series and splines. You can use a 3D sketch as a sweep path, as a guide curve for a loft or sweep, a centerline for a loft, or as one of the key entities in a piping system. Geometric relations can also be added to 3-D Sketches.

Parameters

-  **X Coordinate**
-  **Y Coordinate**
-  **Z Coordinate**
-  **Curvature** (Spline curvature at the frame point)
-  **Tangency** (In the XY plane)
-  **Tangency** (In the XZ plane)
-  **Tangency** (In the YZ plane)

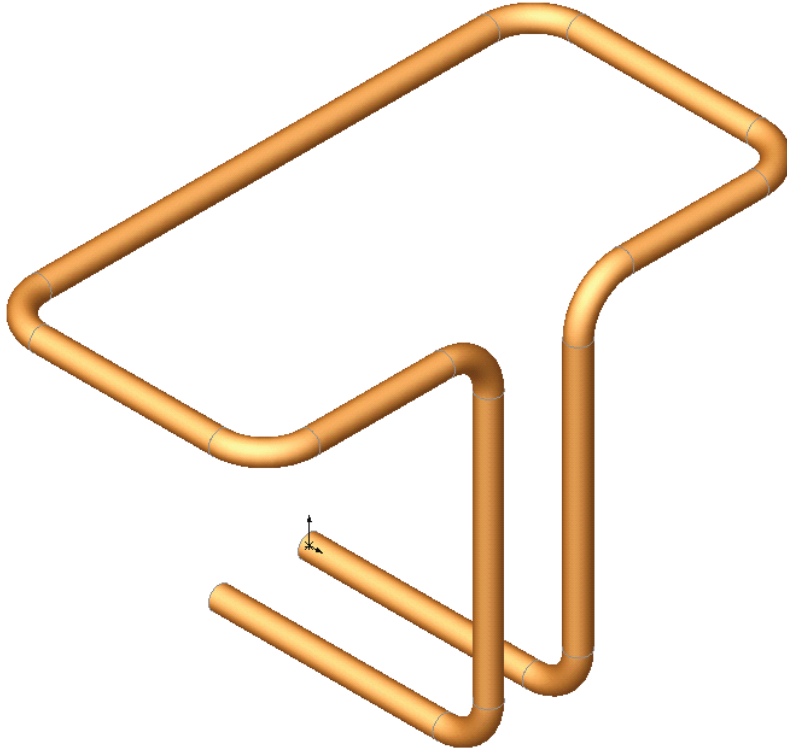


Space Handle



When working in a 3D sketch, a graphical assistant is provided to help you maintain your orientation while you sketch on several planes. This assistant is called a *space handle*. The space handle appears when the first point of a line or spline is defined on a selected plane. Using the space handle, you can select the axis along which you want to sketch.

Introduction to 3D Sketch



Dimensioning Standards: ANSI
Units: INCHES – 3 Decimals

Tools Needed:



3D Sketch



2D Sketch



Sketch Line



Circle



Dimension



Add Geometric Relations



Sketch Fillet

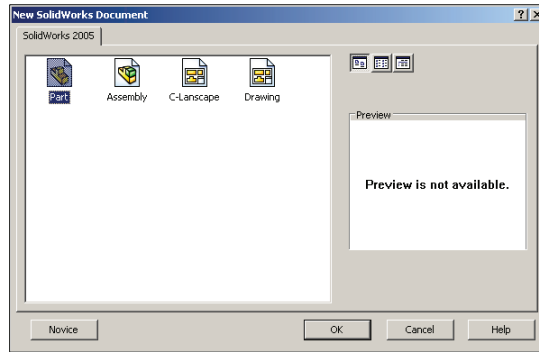


Tab Key






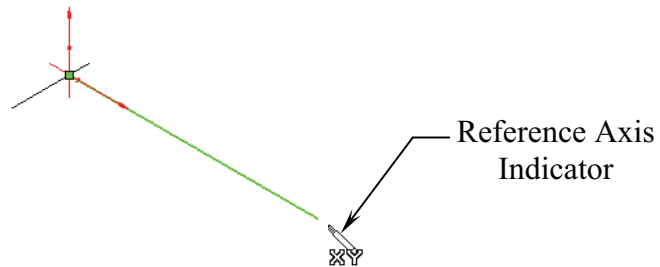
Base/ Boss Sweep

1. Starting a new part file: Select **File / New / Part / OK**.

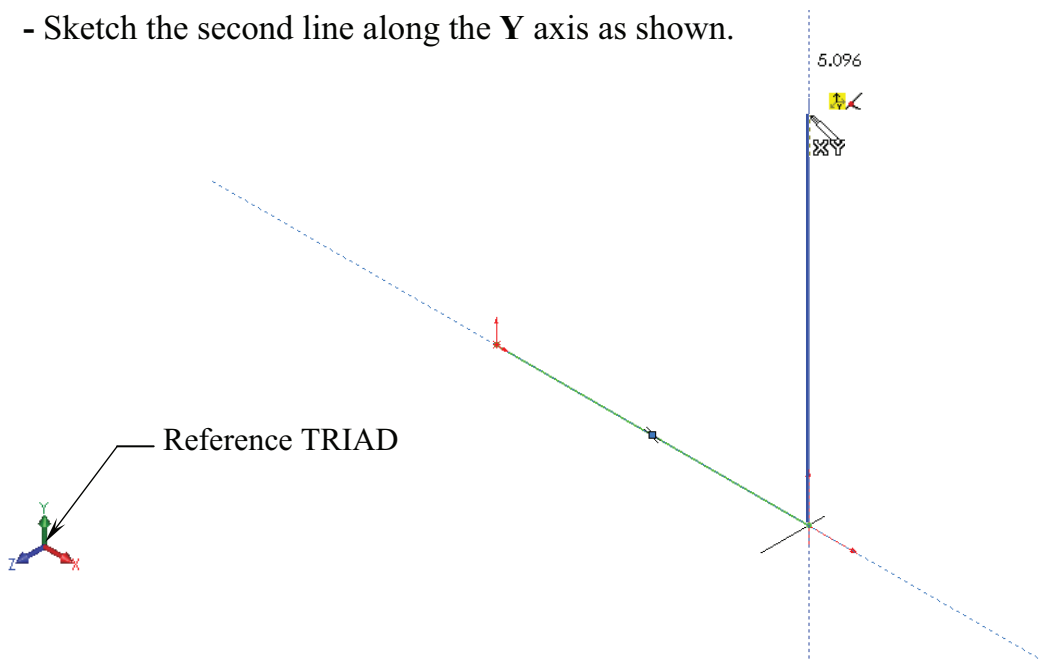


2. Using 3D Sketch:

- Click  or select **Insert / 3D Sketch**, and change to **Isometric view** .
- Select the Line tool  and sketch the first line along the **X** axis.

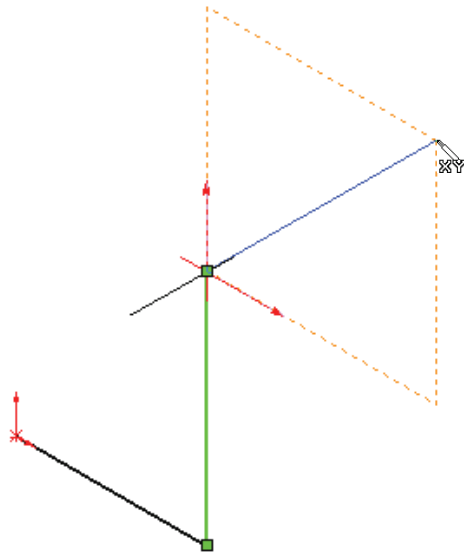



- Sketch the second line along the **Y** axis as shown.



3. Changing direction:

- By default, your sketch is relative to the default coordinate system in the model.
- To switch to one of the other two default planes, press the **TAB** key. The reference origin of the current sketch plane is displayed.

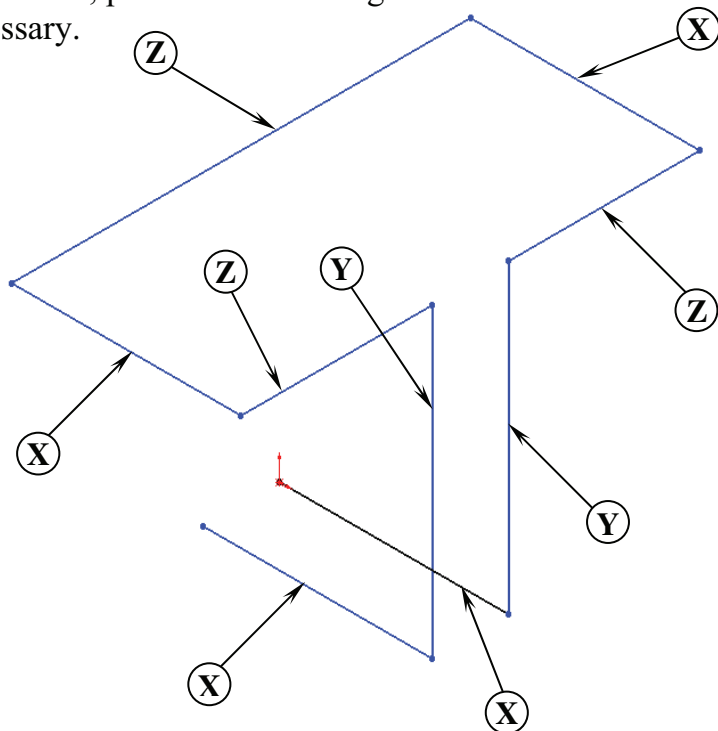


 **The TAB key**


While dragging the mouse cursor (when sketching the lines), press the **TAB** key to switch to other planes/directions.

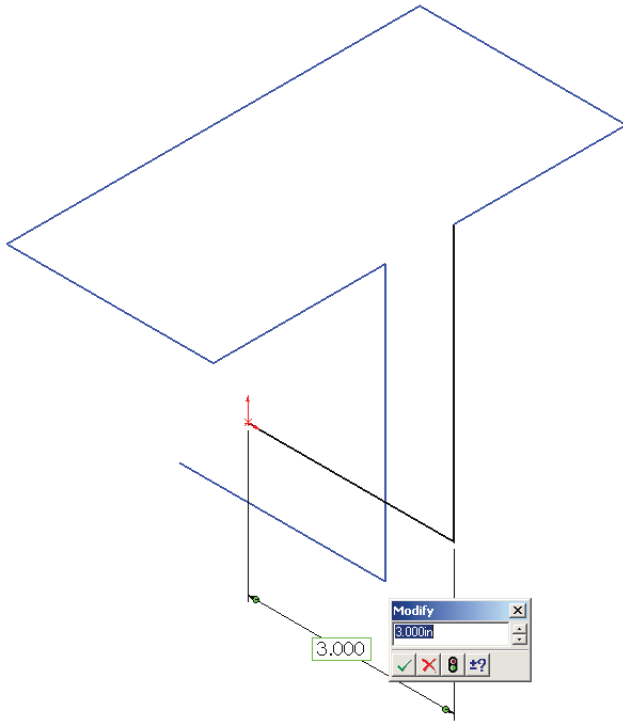
4. Completing the profile:

- Follow the axis as labeled; press **TAB** to change the direction if necessary.

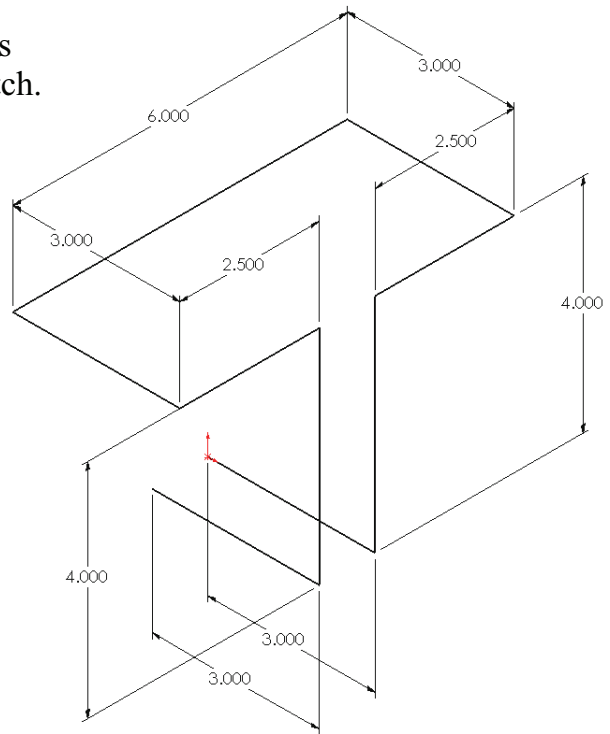


5. Adding dimensions:


- Click  or select **Tools / Dimensions / Smart**.
- Click on the first line and add a dimension of **3.00**".

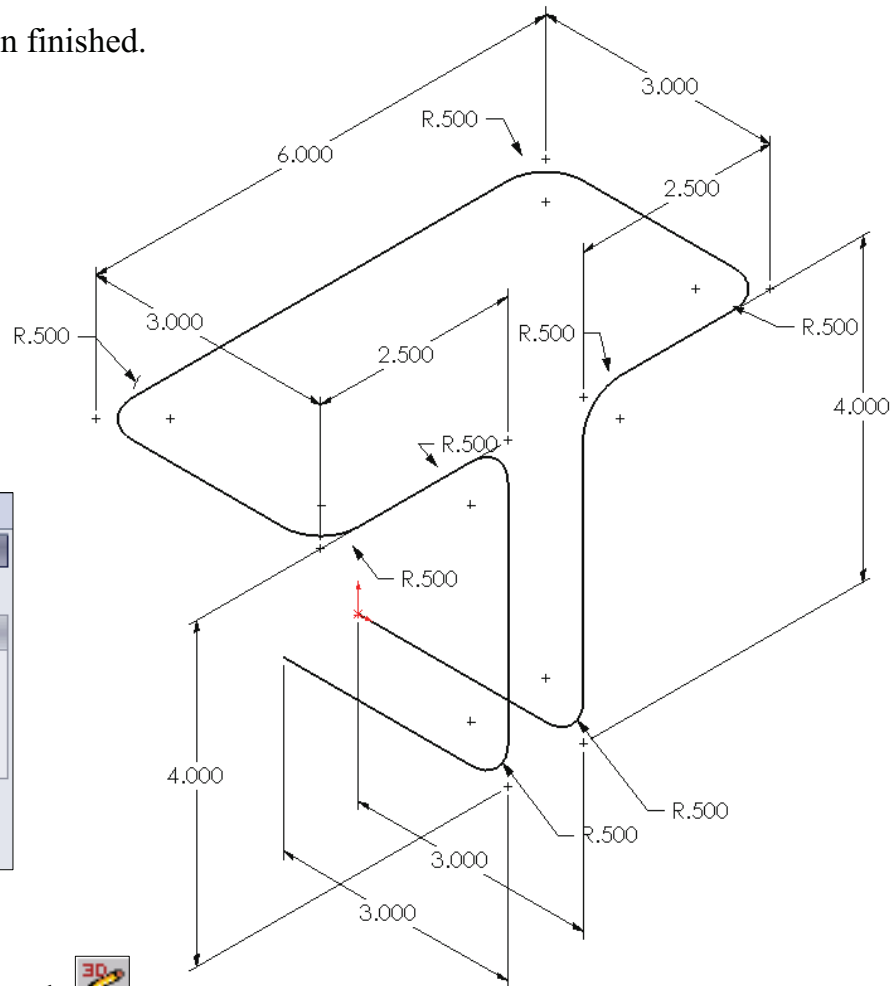
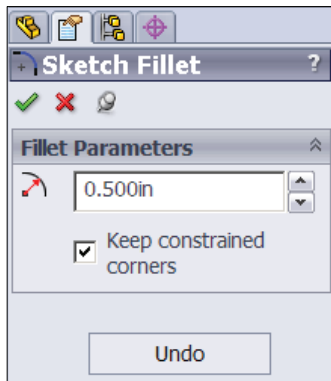


- Continue adding the dimensions as shown, to fully define the 3D sketch.




6. Adding the Sketch Fillets:

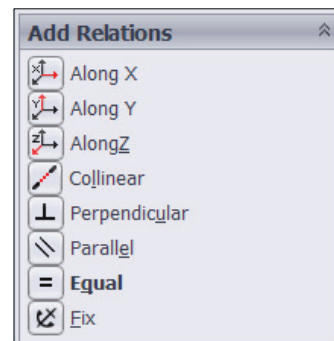
- Click  or select **Tools / Sketch Tools / Fillet**.
- Add **.500"** fillets to all the intersections as indicated.
- Enable the **Keep Constrained Corner** check box.
- Click OK when finished.





- Exit the 3D Sketch  or press **Control + Q**.

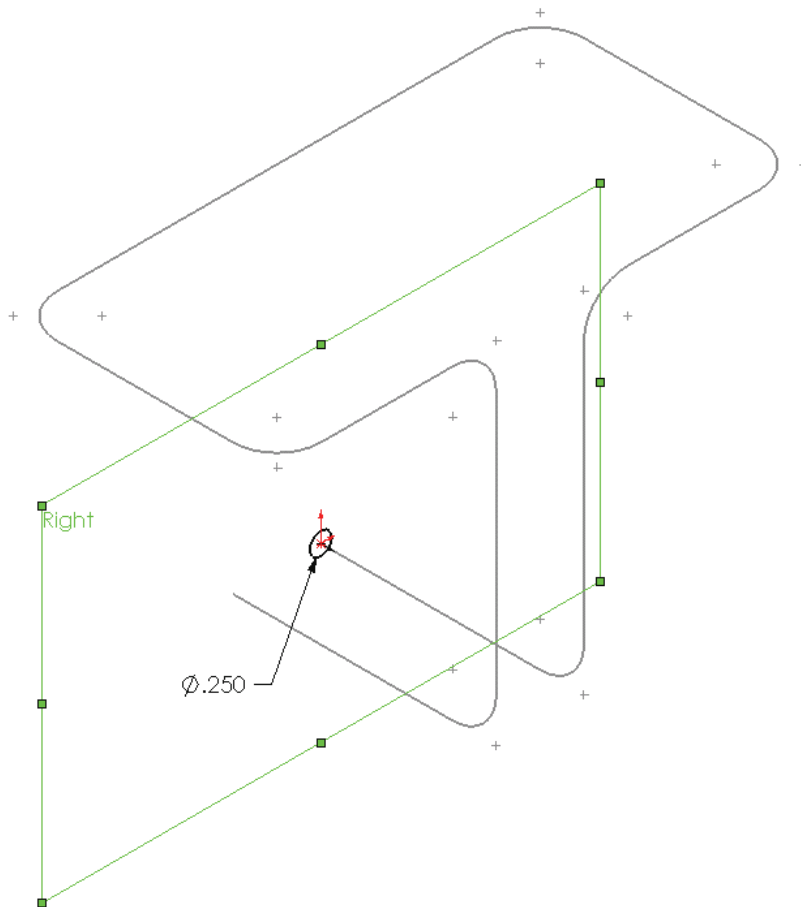
 **Relations**



Geometric Relations such as Along Z and Equal can also be use to replace some of the duplicate dimensions.



7. Sketching the Sweep Profile:

- Select the RIGHT plane from the FeatureManager tree.
- Click  to open a new sketch or select **Insert / Sketch**.
- Sketch a Circle  using the Origin as the center. (The system automatically creates a Coincident relation between the Center of the circle and the Origin.)







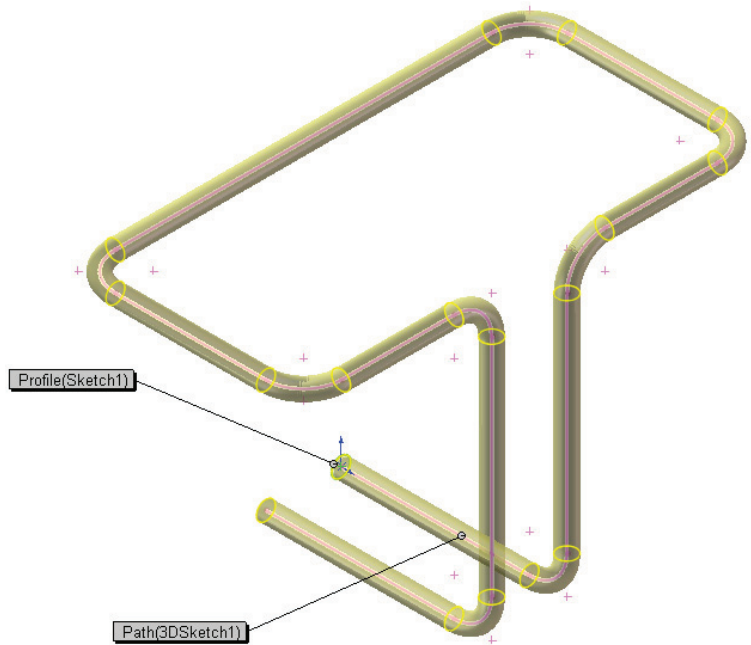
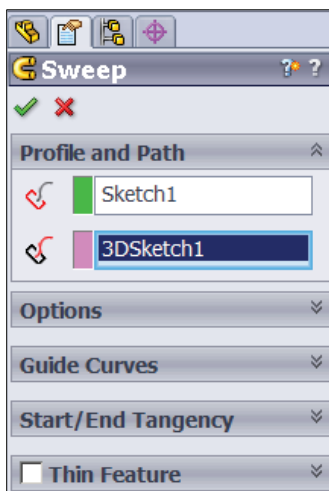
- Add a **Ø.250** dimension  to fully define the circle.
- Exit the Sketch  or select **Insert / Sketch**.

Note:

- *The Sweep Profile should be Pierced or Coincident with the Sweep Path.*
- *The Swept Boss/Base command is only available when the sketch pencil is off.*

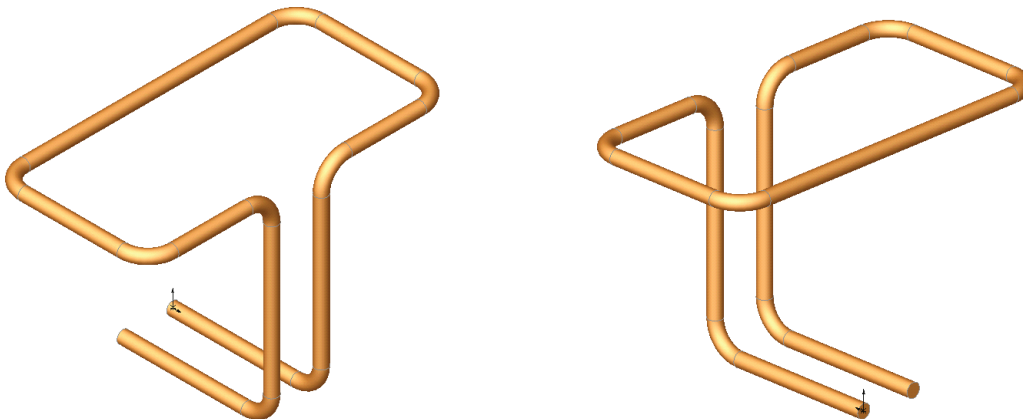
8. Creating the Swept feature:

- Click  or select **Insert / Boss-Base / Sweep**.
- Select the Circle as Sweep Profile  (Sketch1)
- Click anywhere on the 3D Sketch to use as Sweep Path  (3Dsketch1).
- Click **OK** .



9. Saving your work:

- Select **File / Save As / 3D Sketch / Save**.



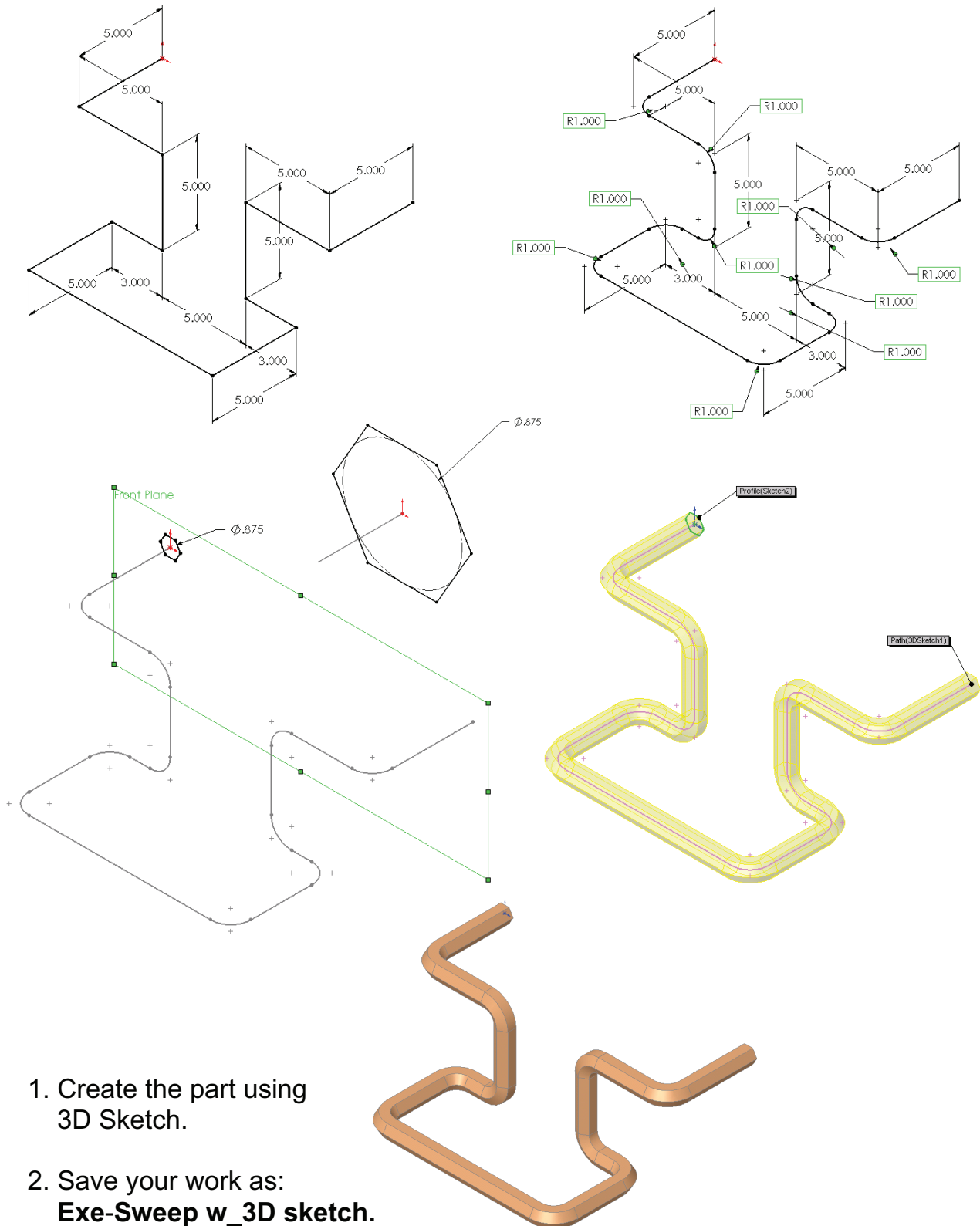
Questions for Review

3D Sketch

1. When using 3D Sketch, you do not have to pre-select a plane as you would in 2D Sketch.
 - a. True
 - b. False
2. The space handle appears only after the first point of a line is started.
 - a. True
 - b. False
3. To switch to other planes in 3D Sketch mode, press:
 - a. Up Arrow
 - b. Down Arrow
 - c. TAB key
 - d. CONTROL key
4. Dimensions cannot be used in 3D Sketch mode.
 - a. True
 - b. False
5. Geometric Relations cannot be used in 3D Sketch mode.
 - a. True
 - b. False
6. All of the sketch tools in 2D Sketch are also available in 3D Sketch.
 - a. True
 - b. False
7. 3D Sketch entities can be used to extrude a solid feature.
 - a. True
 - b. False
8. 3D Sketch entities can be used as a path in a swept feature.
 - a. True
 - b. False

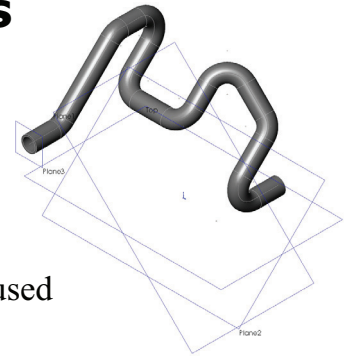
1. TRUE
2. TRUE
3. C
4. FALSE
5. FALSE
6. FALSE
7. FALSE
8. TRUE

Exercise: Sweep with 3D Sketch






Exercise: 3D Sketch & Planes

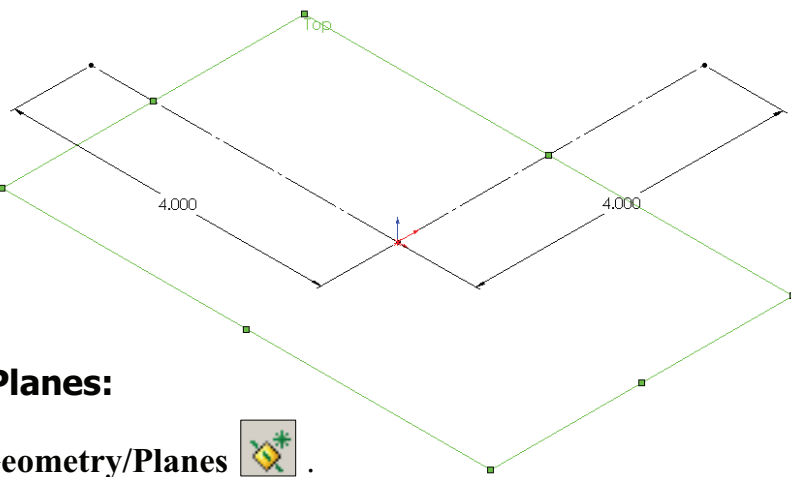
A 3D sketch normally consists of lines and arcs in series, and splines. You can use a 3D sketch as a sweep path, as a guide curve for a loft or sweep, a centerline for a loft, or as one of the key entities in a routing system.





The following exercise demonstrates how several planes can be used to help define the directions of the 3D Sketch Entities.

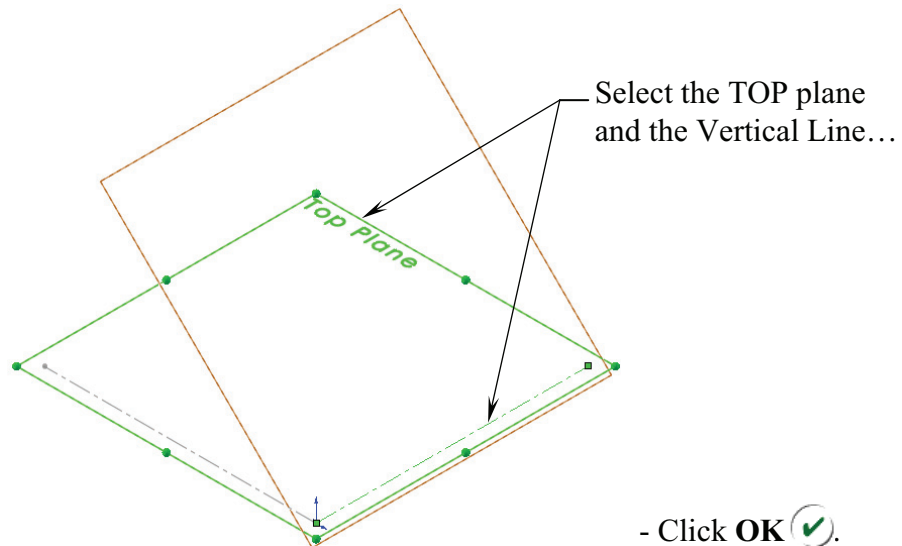
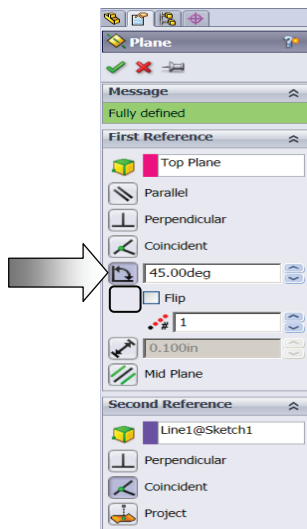
1. Sketching the reference Pivot lines:

- Select the TOP plane and open a new sketch  .
- Sketch 2 Centerlines  and add Dimensions  as shown.





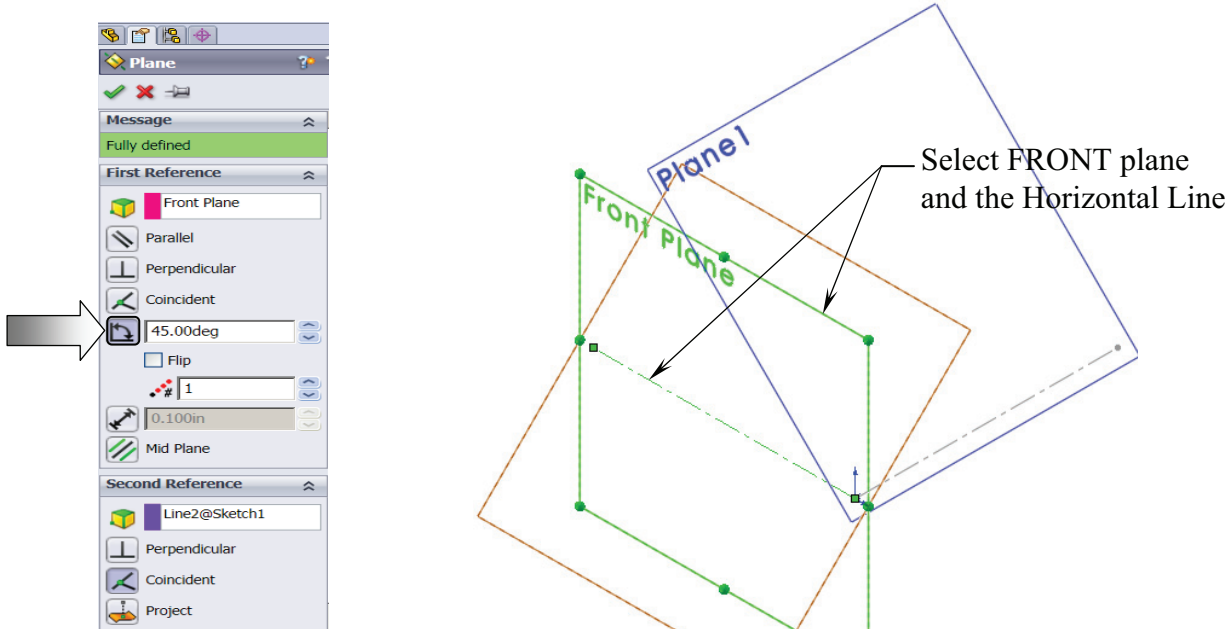
2. Creating the 1st 45° Planes:

- Select **Insert/Reference Geometry/Planes**  .
- Click the **At Angle** Option and enter **45** as Angle  .
- Select the TOP plane and the Vertical line as noted.

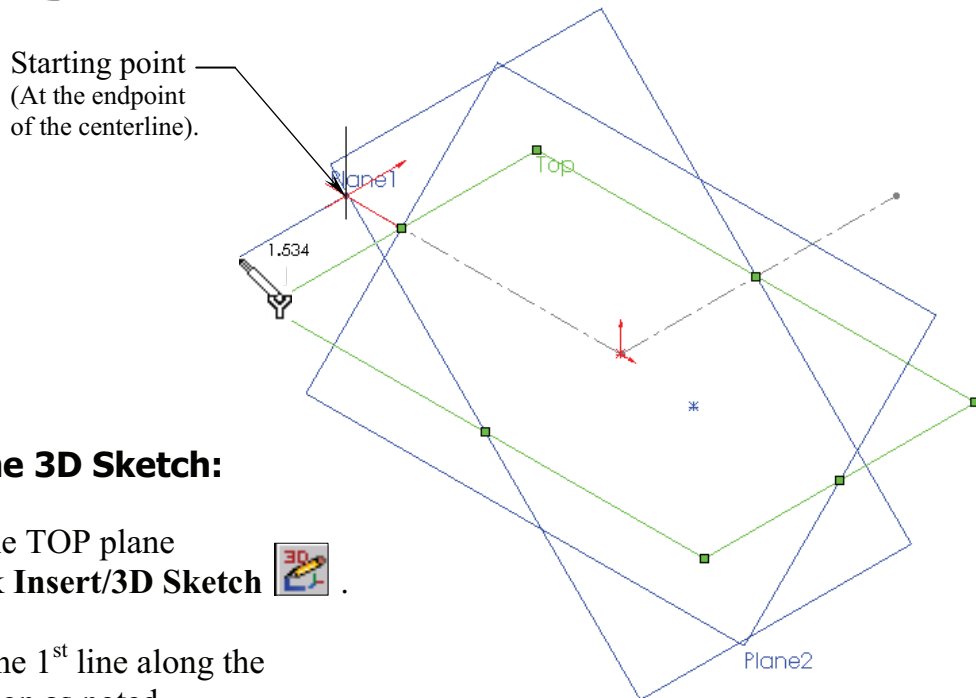


3. Creating the 2nd 45° Planes:


- Select **Insert/Reference Geometry/Planes**  .
- Click the **At Angle** Option and enter **45** for Angle  .
- Select the **FRONT** plane and the Horizontal line as noted.



- Click **OK**  .

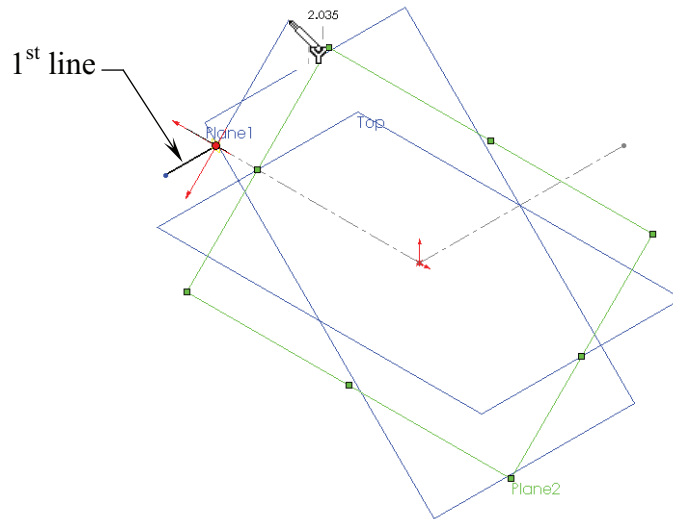


4. Creating the 3D Sketch:

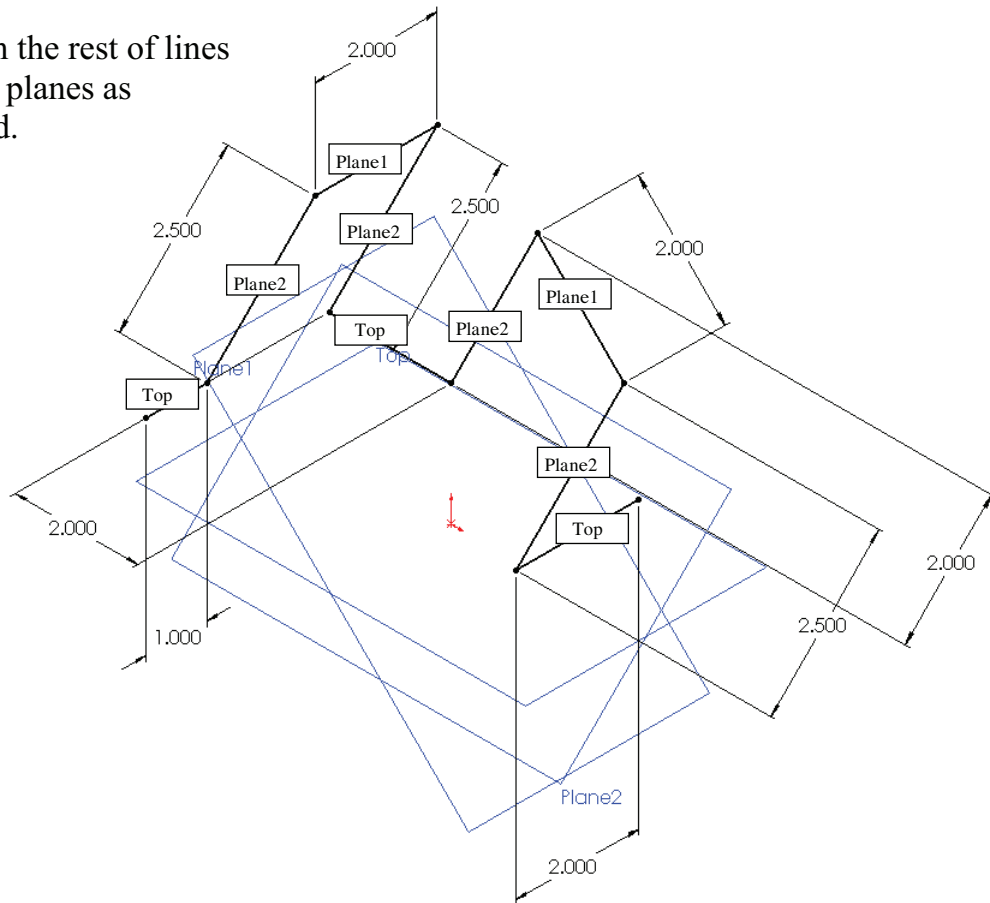
- Select the **TOP** plane and click **Insert/3D Sketch**  .
- Sketch the 1st line along the **Y** direction as noted.



SolidWorks 2010 | Advanced Techniques | 3D Sketch

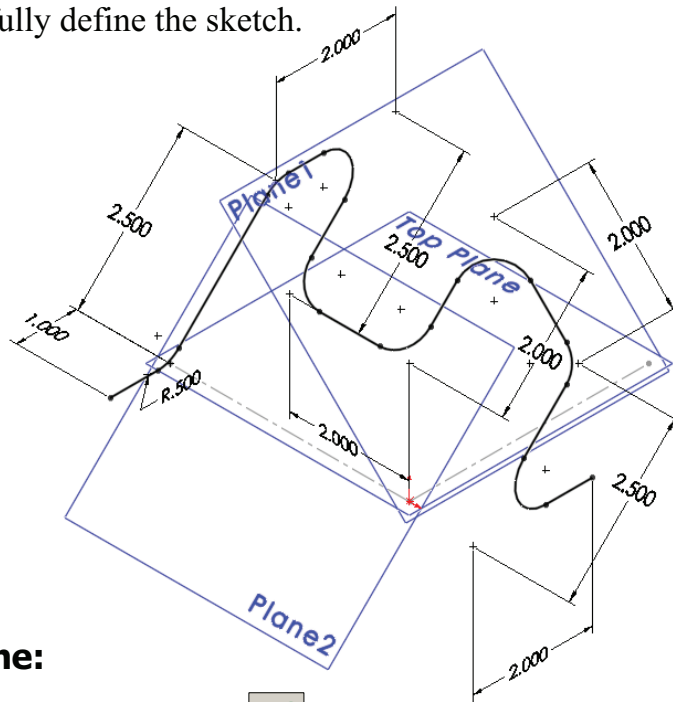
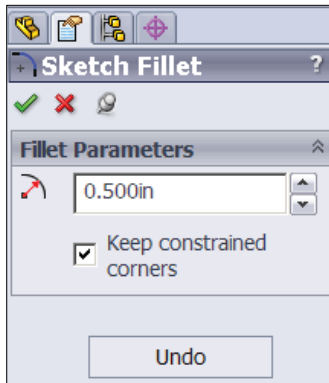
- Select the **PLANE2** (45 deg.) from the Feature Manager tree and Sketch the 2nd line along the **Y** direction (watch the cursor feedback symbols).




- Sketch the rest of lines on the planes as labeled.

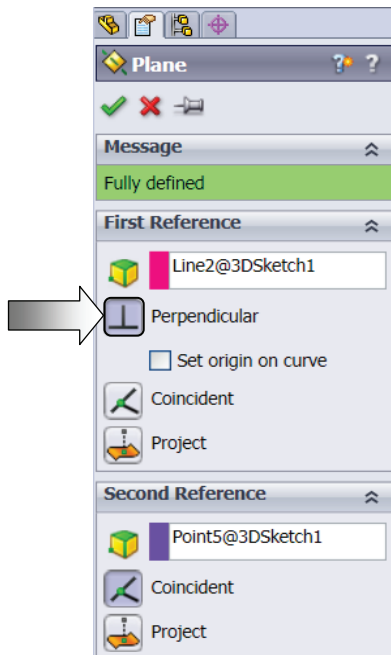


- Add **Sketch Fillets**  of **.500 in.** to all corners.
- Add **Dimensions**  to fully define the sketch.

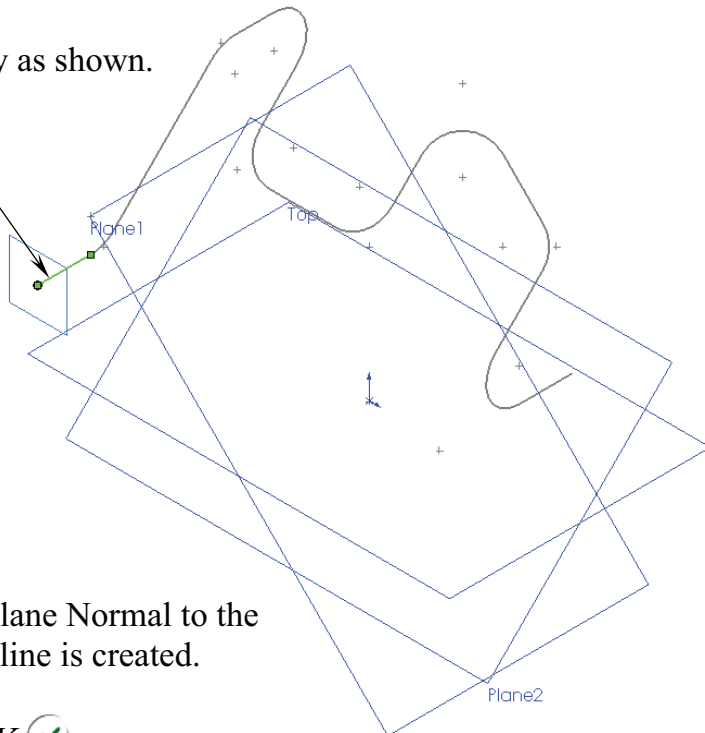



5. Creating a new work plane:

- Select **Insert/Reference Geometry/Plane** .
- Click the **Normal To Curve** option.
- Select the line approximately as shown.





Click here

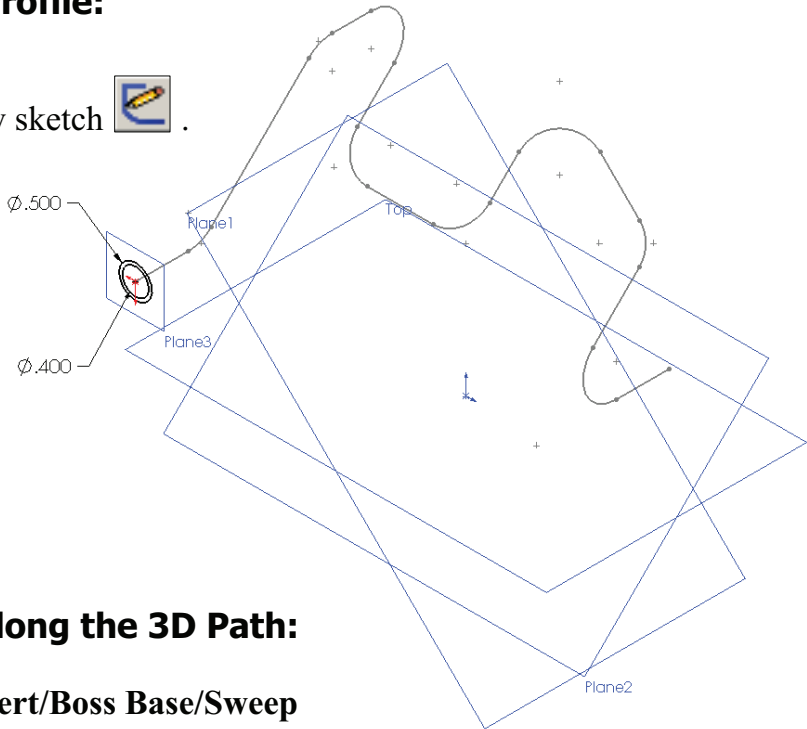


- A new plane Normal to the selected line is created.
- Click **OK** .

6. Sketching the Sweep Profile:


- Select the new plane (Plane3) and open a new sketch .


- Sketch 2 Circles  on the same center and add the dimensions as shown to fully define the sketch.

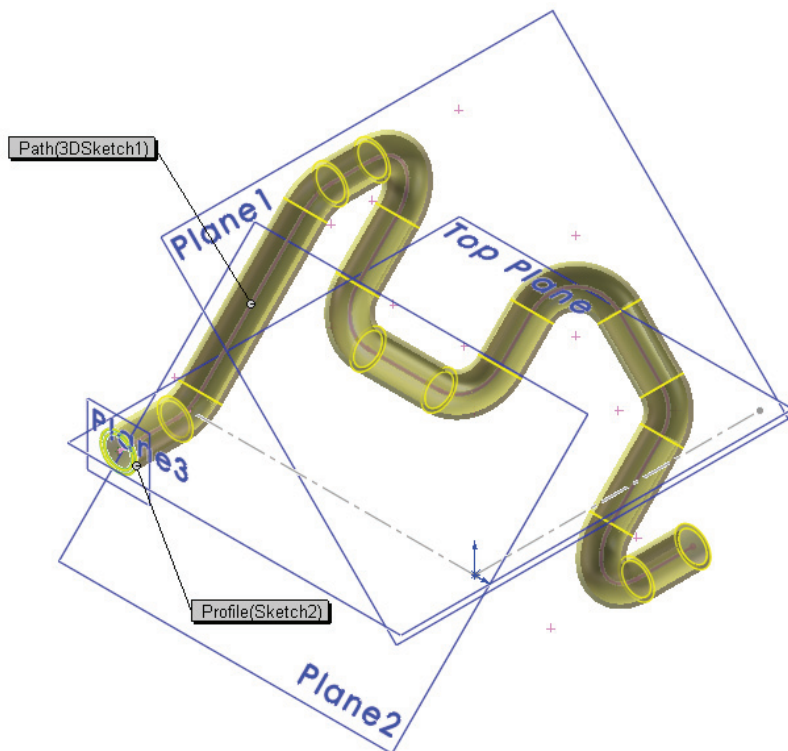
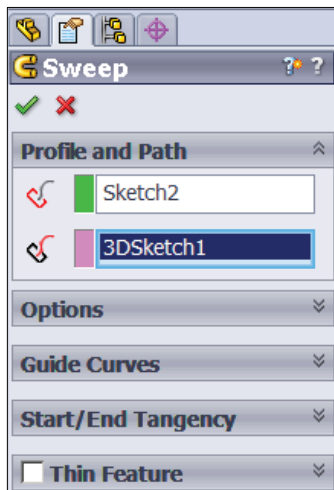


7. Sweeping the Profile along the 3D Path:

- Click  or Select **Insert/Boss Base/Sweep**

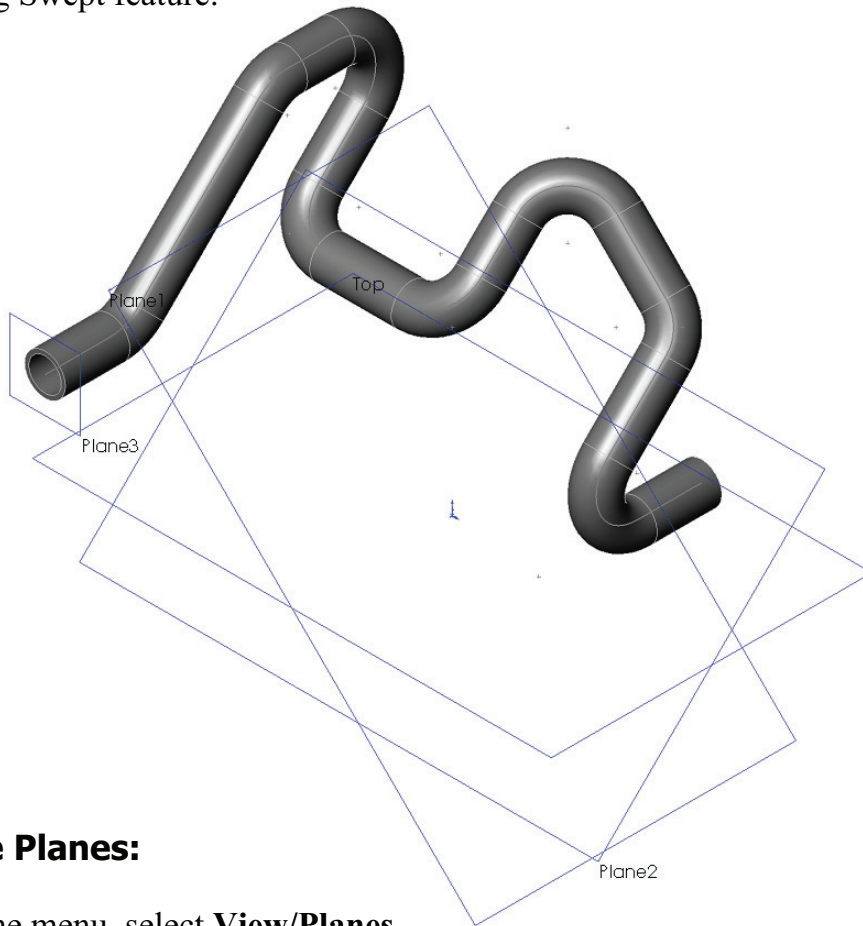
- Select the Circles as the Sweep Profile .

- Select the 3D Sketch as the Sweep Path .



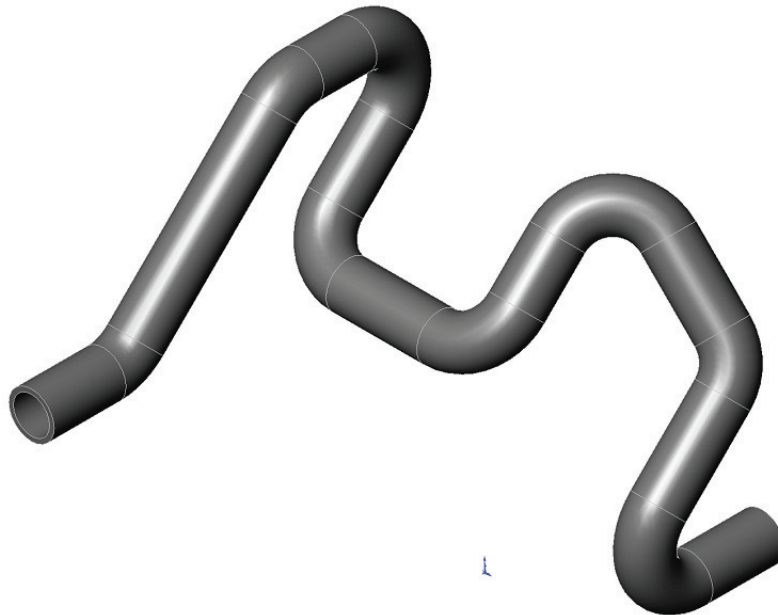
- Click **OK** .

- The resulting Swept feature.



8. Hiding the Planes:

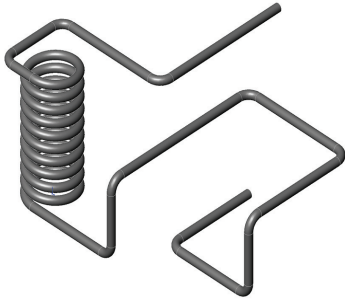
- From the menu, select **View/Planes**.
- The planes are temporarily put away from the scene.



9. Saving your work:

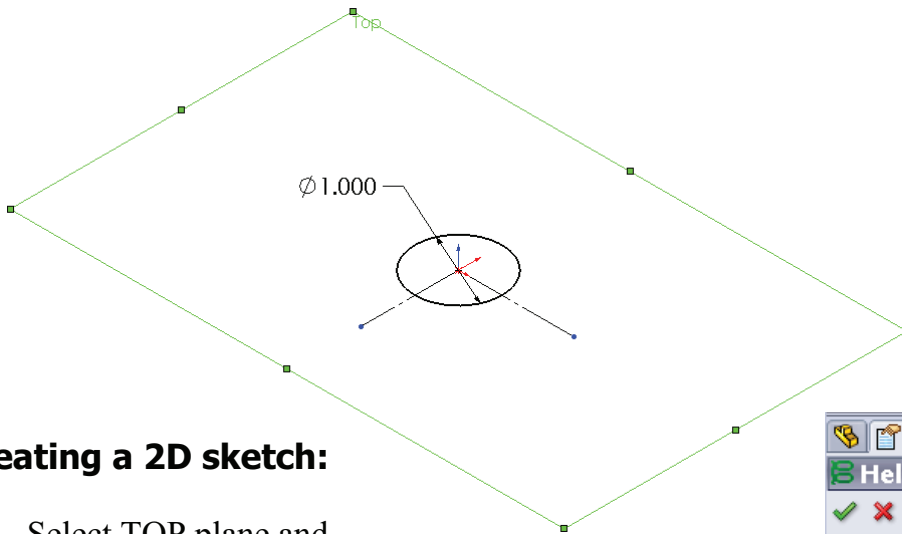
- Click **File/Save As:**
3D-Sketch-Planes.
- Click **Save.**

Exercise: 3D Sketch & Composite Curve





A 3D sketch normally consists of lines and arcs in series, and Splines. You can use a 3D sketch as a sweep path, as a guide curve for a loft or sweep, a centerline for a loft, or as one of the key entities in a routing system.

The following exercise demonstrates how several 3D Sketches can be created and combined into 1 continuous Composite Curve for use as a Sweep Path.

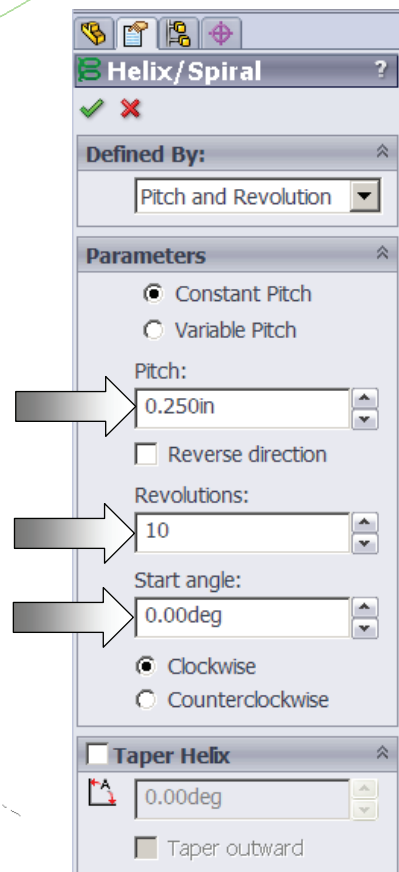
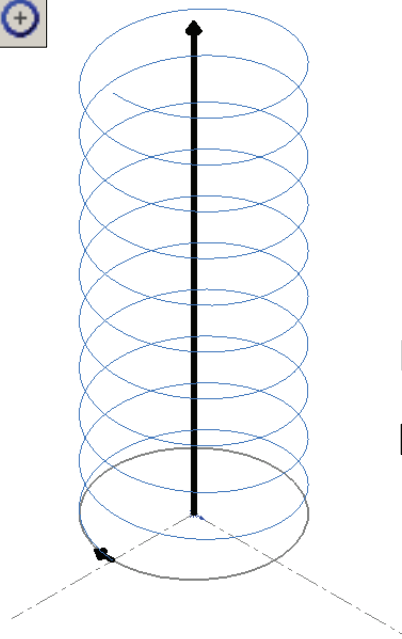


1. Creating a 2D sketch:

- Select TOP plane and sketch a 1.00 in. Circle 
- and 2 Centerlines .

2. Creating a Helix:

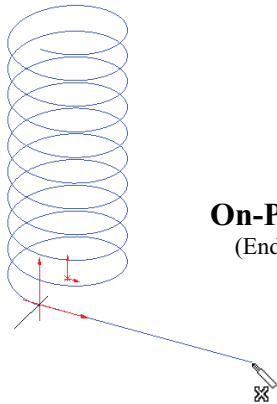
- Select **Insert/Curve/ Helix-Spiral** .
- Pitch: .250 in.
- Revolution: 10
- Starting Angle: 0 deg.
- Click **OK** .



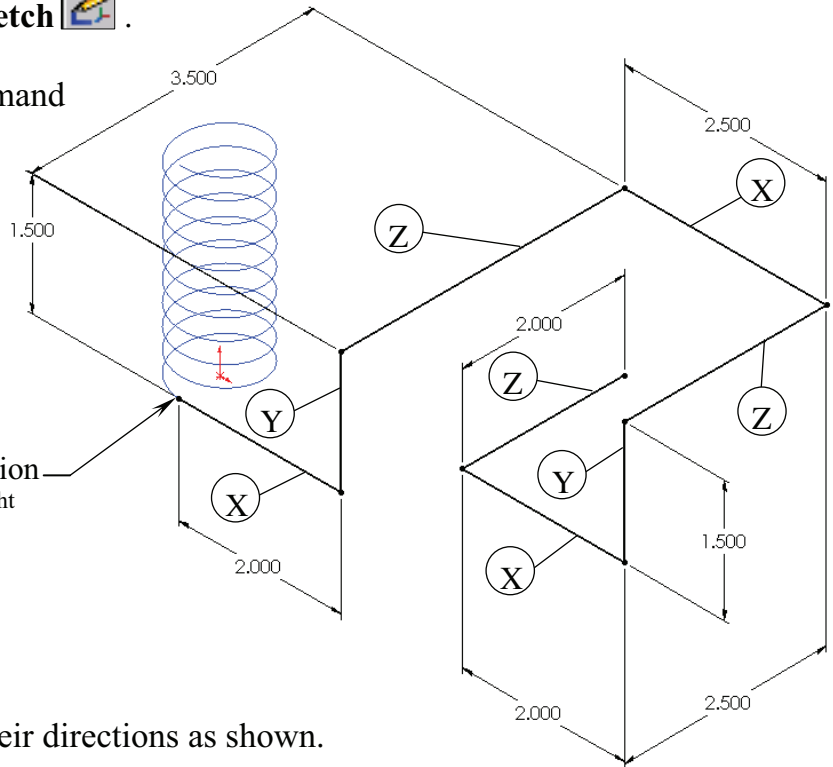
3. Creating the 1st 3D sketch:

- Select **Insert/3D Sketch** .


- Select the **Line** command and sketch the 1st line along the X direction.

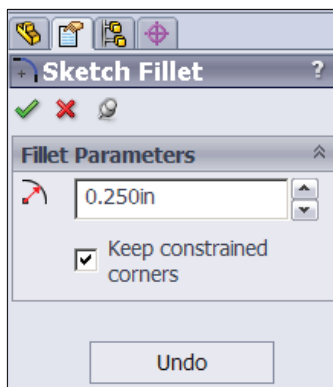



On-Plane relation
(End point & Right plane)



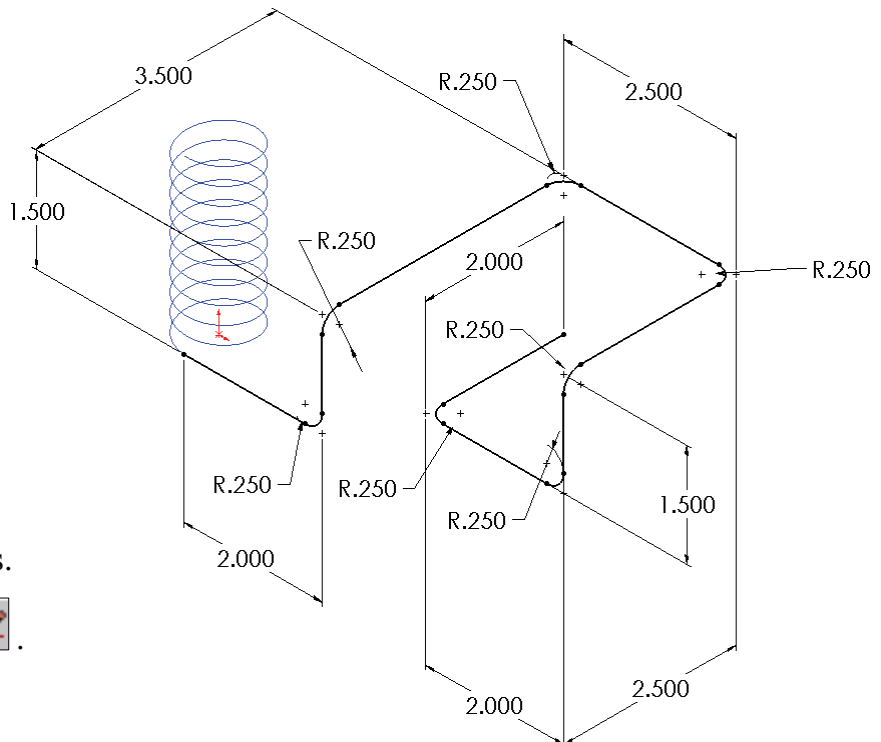
- Add other lines in their directions as shown.

- Add dimensions  to fully define the sketch.





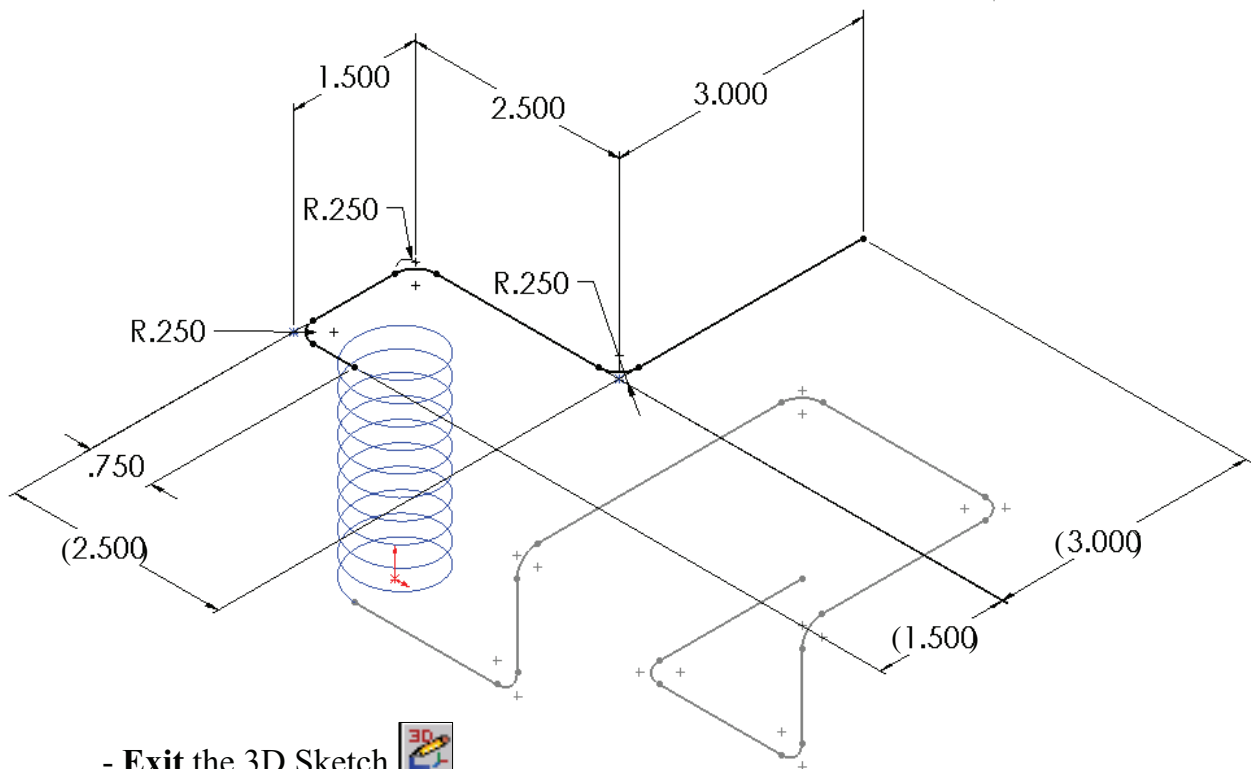
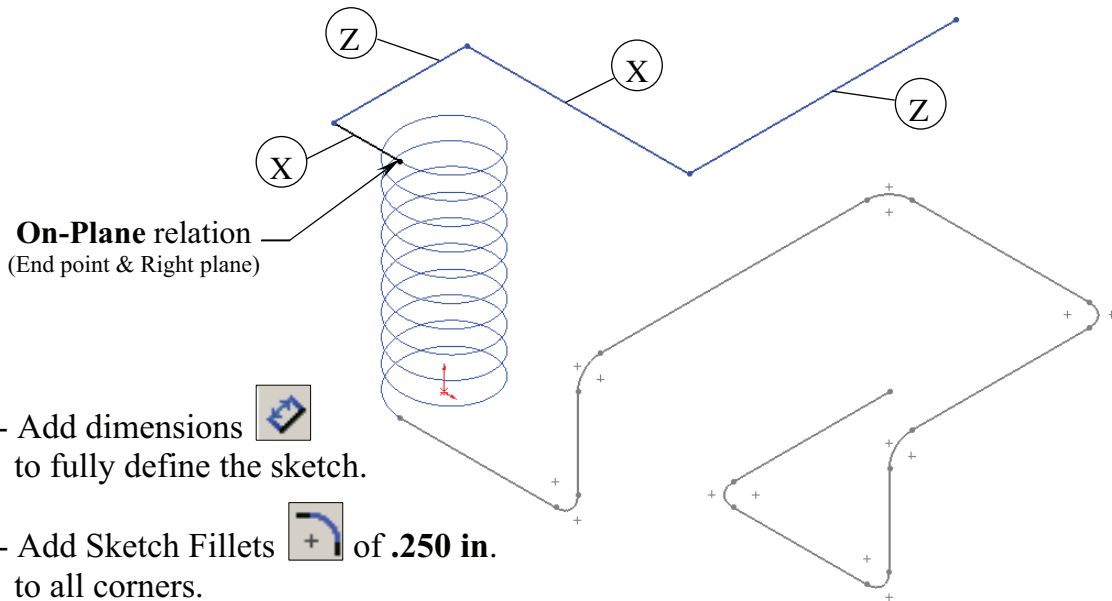
- Add Sketch Fillets  of **.250 in.** to all corners.

- **Exit** the 3D Sketch .



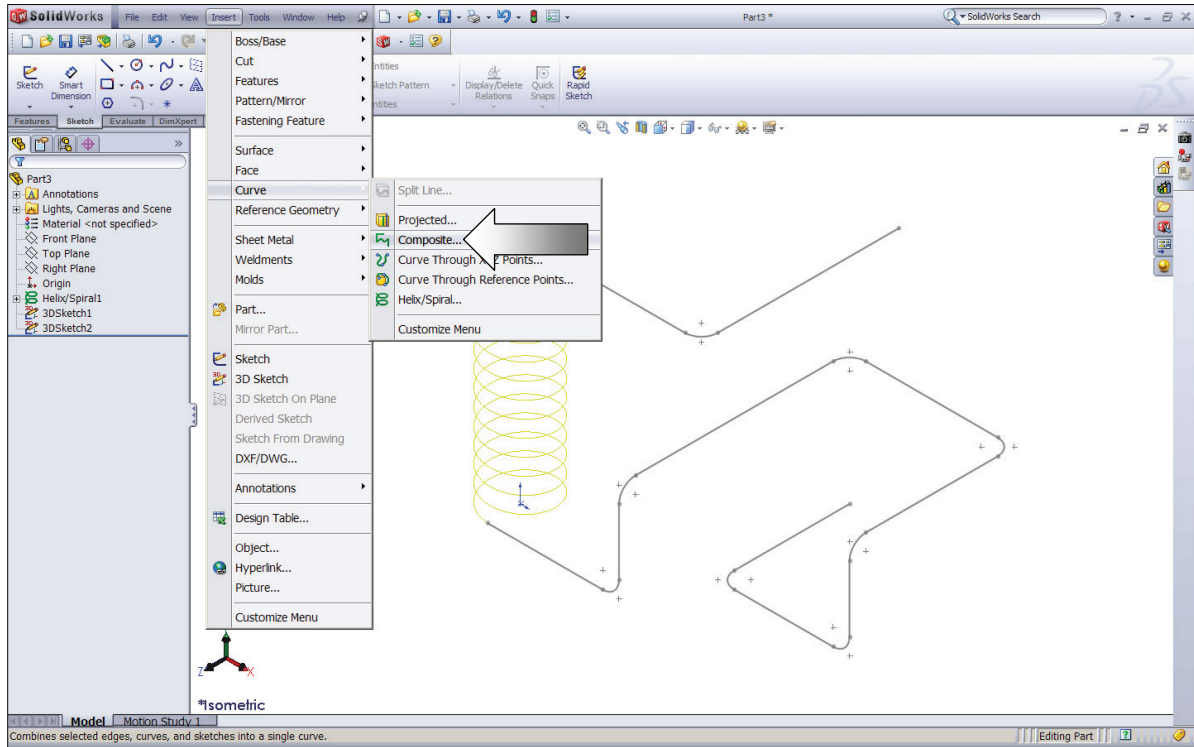
4. Creating the 2nd 3D sketch:

- Select **Insert/3D Sketch** 
- Select the **Line** command  and sketch the 1st line along the X direction.
- Sketch the rest of the lines following their directions shown below.

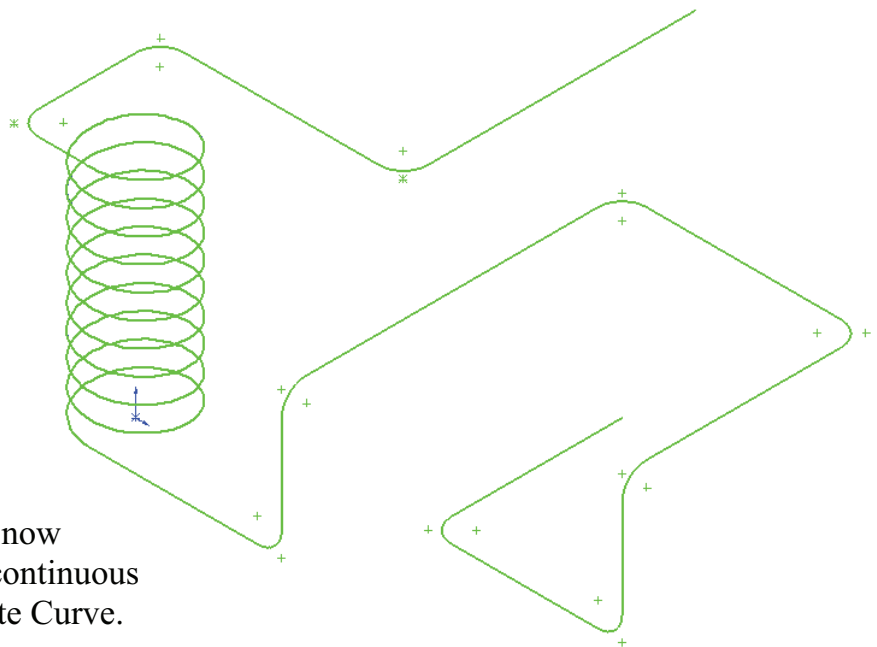
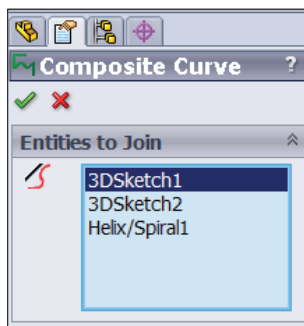


5. Combining the 3 sketches into 1 curve:

- Select Insert/Curve/Composite .




- Select the 3 Sketches either from the Feature Manager tree – or – directly from the graphics area.

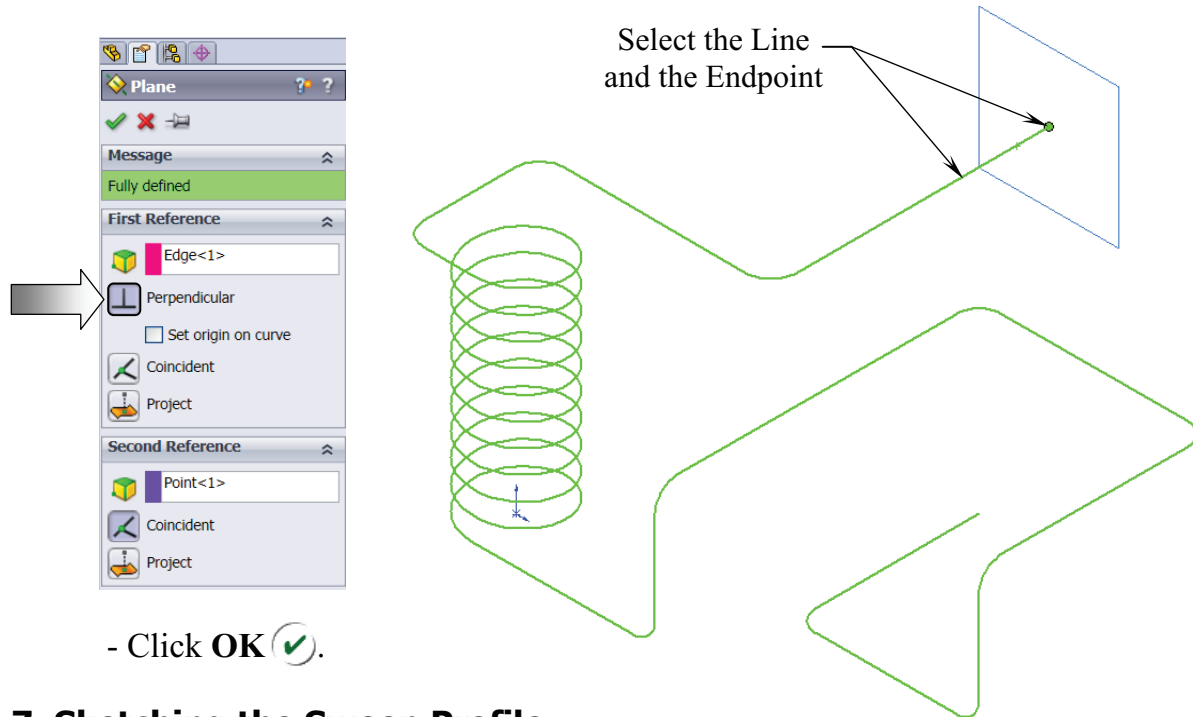


- Click **OK** .




- The Sketches are now combined into 1 continuous curve, a Composite Curve.

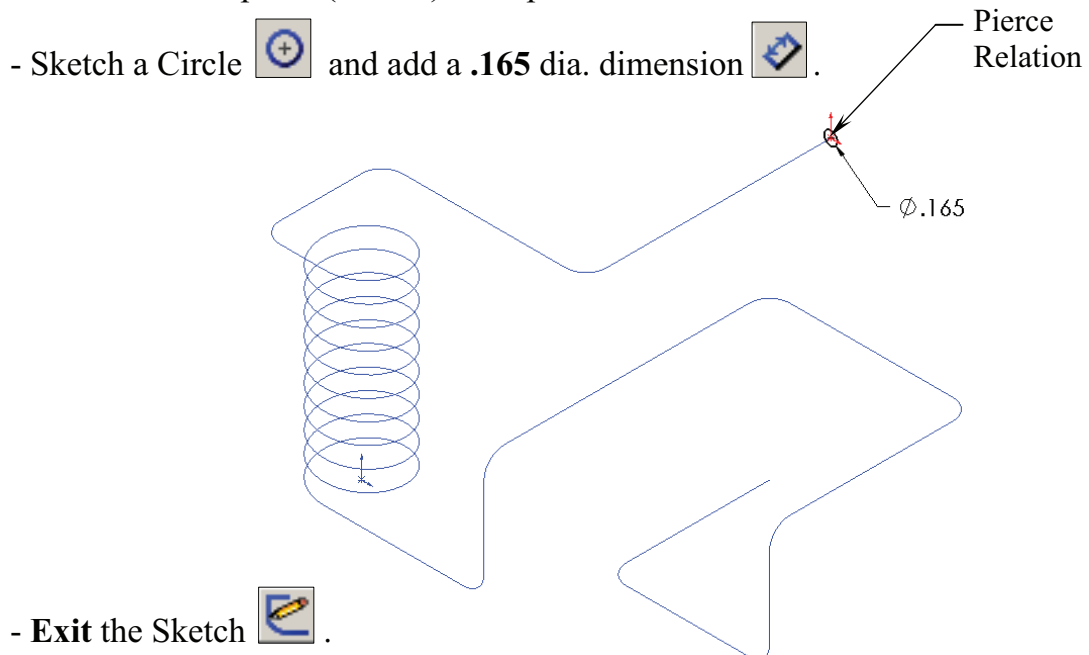
6. Creating a new work plane:

- Select **Insert/Reference Geometry/Plane**  .
- Click the **Normal To Curve** option and select the edge and the endpoint as noted.






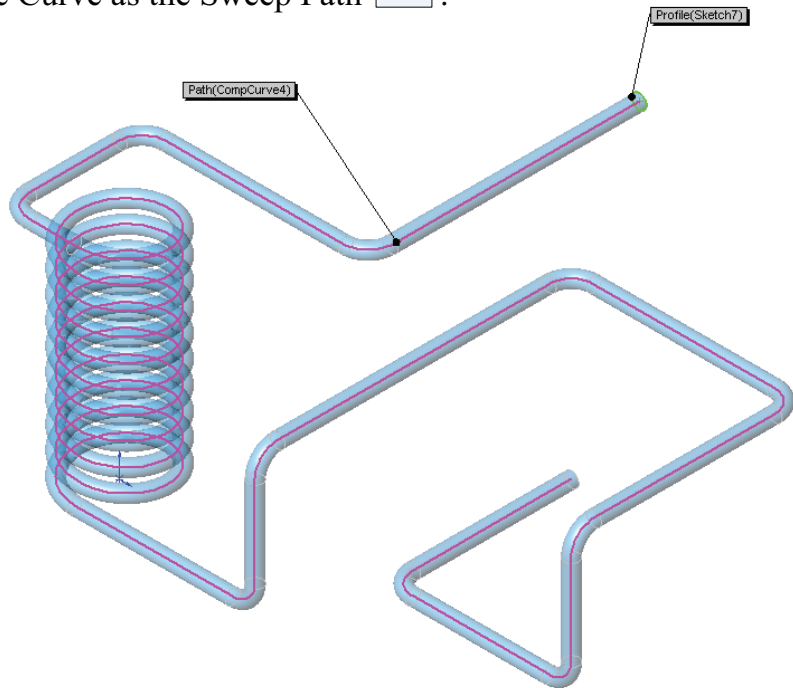
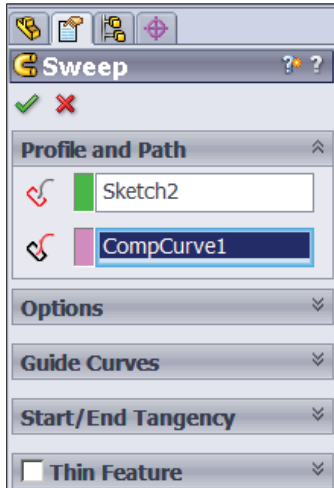
7. Sketching the Sweep Profile:

- Select the new plane (Plane1) and open a new sketch .
- Sketch a Circle  and add a **.165** dia. dimension .



8. Sweeping the Profile along the Path:

- Select **Insert/Boss Base/ Sweep** .
- Select the Circle as the Sweep Profile .
- Select the Composite Curve as the Sweep Path .



- Click **OK** .

9. Saving your work:

- Click **File/Save As.**
- Enter **3D Sketch – Composite Curve**
- Click **Save.**

