

Inside:

SUPPLEMENTAL

FILES ON CD

SolidWorks 2011

Part II - Advanced Techniques

Advanced Level Tutorials

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

Written by: Sr. Certified SolidWorks Instructor
Paul Tran, CSWP, CSWI

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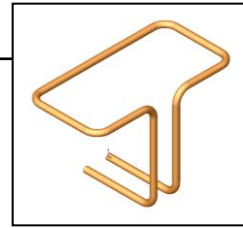
Schroff Development Corporation

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)



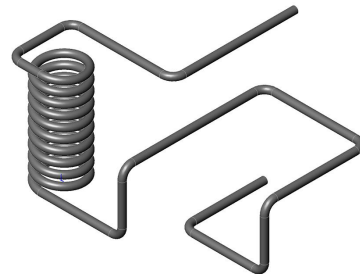
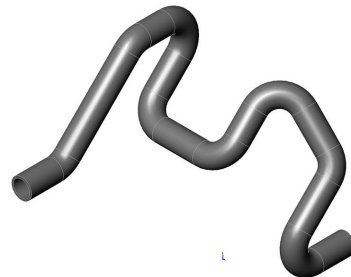
Tangency (In the **XY** plane)



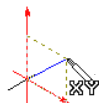
Tangency (In the **XZ** plane)



Tangency (In the **YZ** plane)

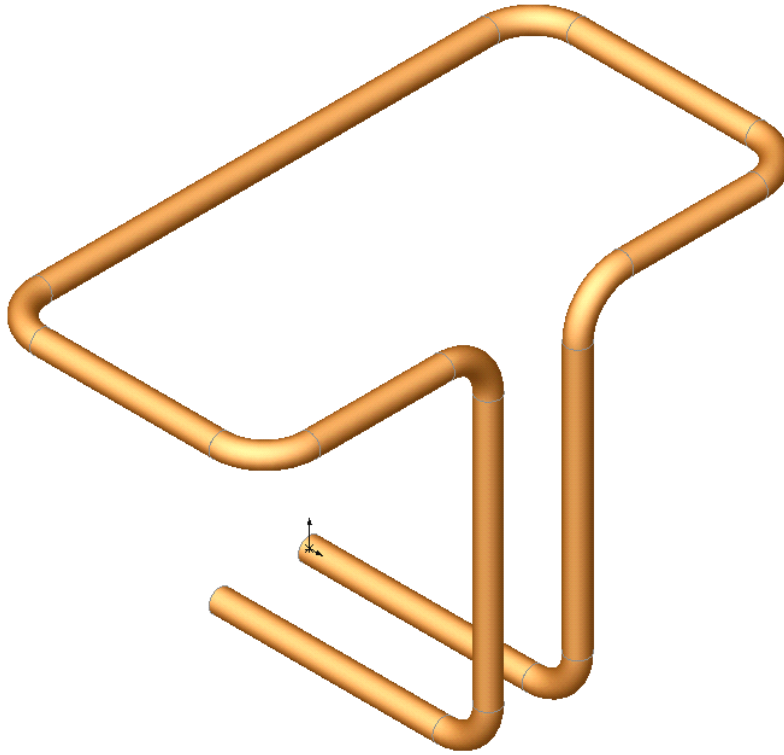


Space Handle



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

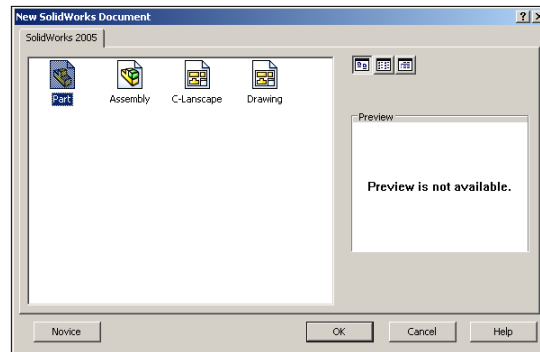


Tab Key






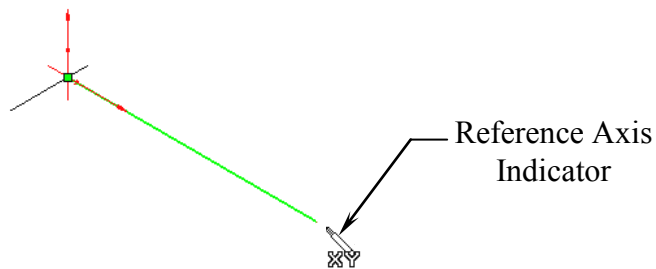
Base/ Boss
Sweep

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

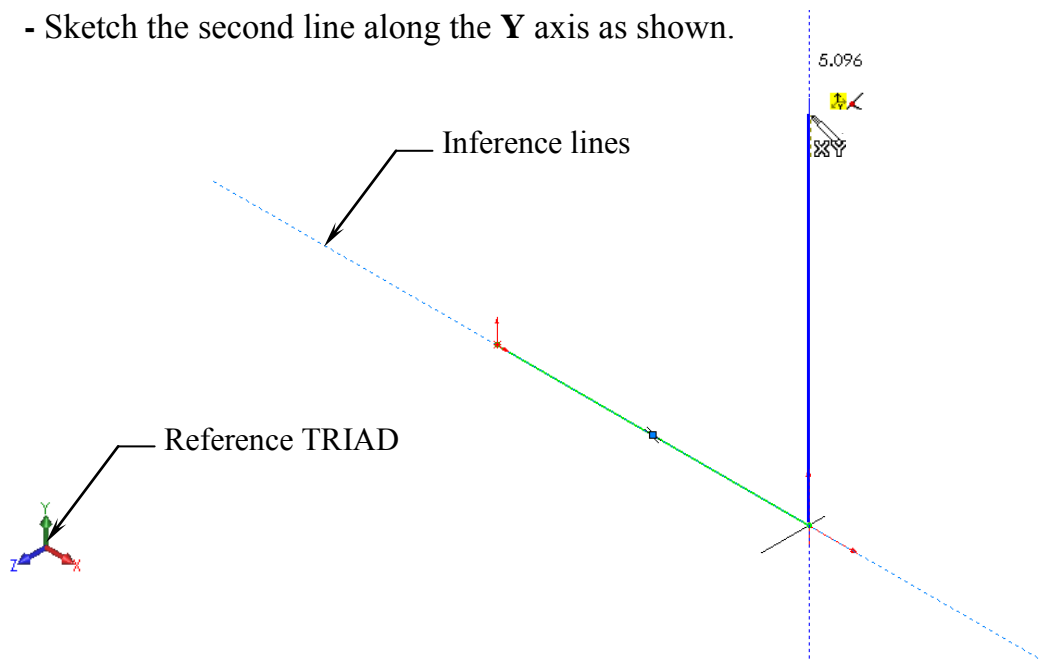


2. Using 3D Sketch:

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

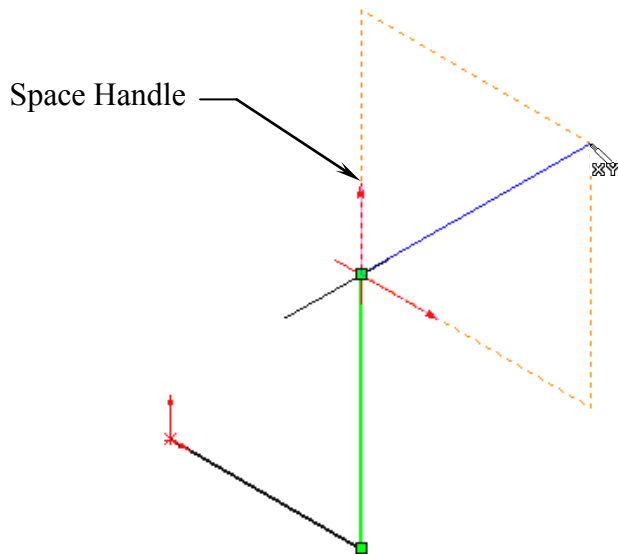


- Sketch the second line along the **Y** axis as shown.



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.

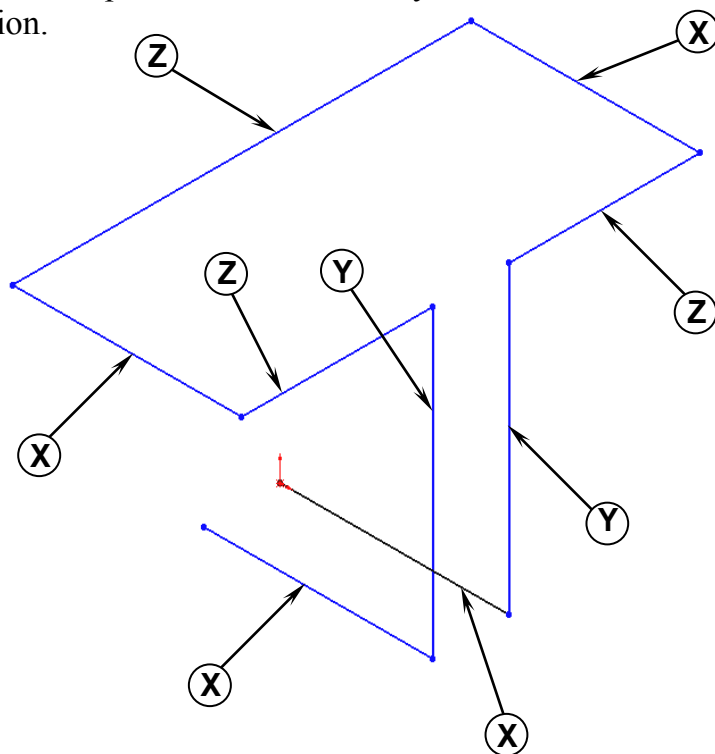


The TAB key


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

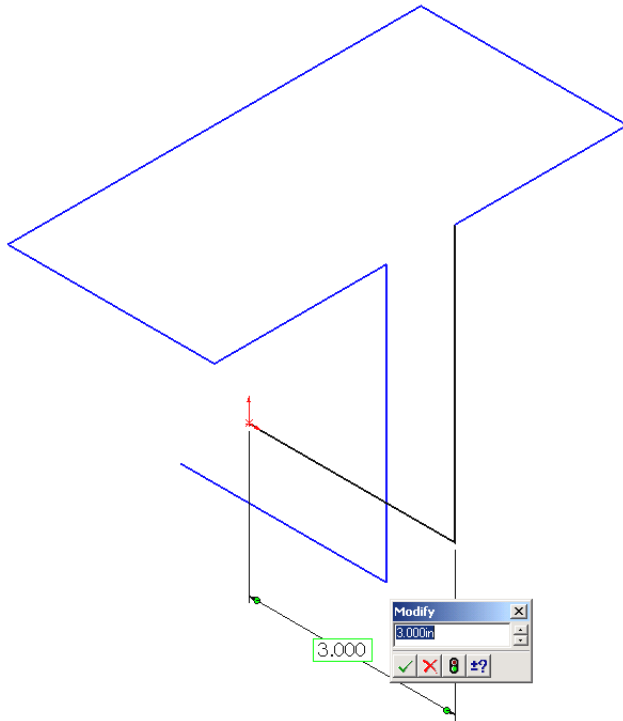
4. Completing the profile:

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

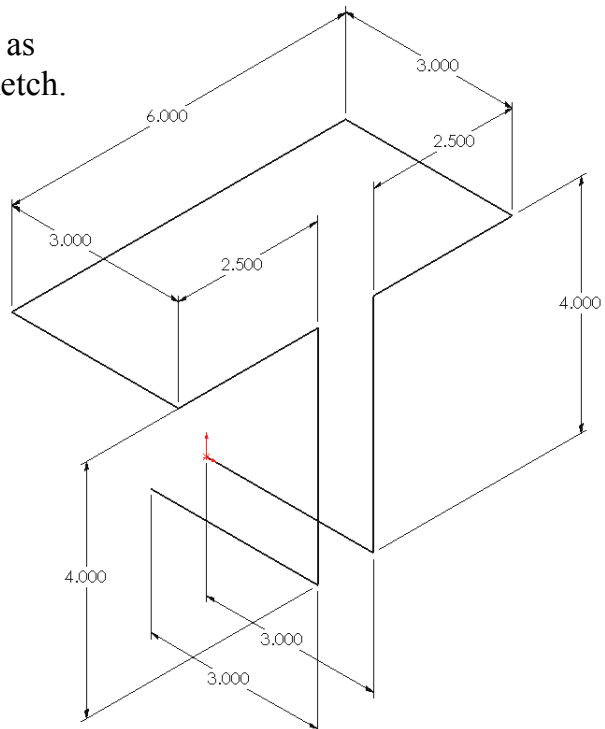


5. Adding dimensions:


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

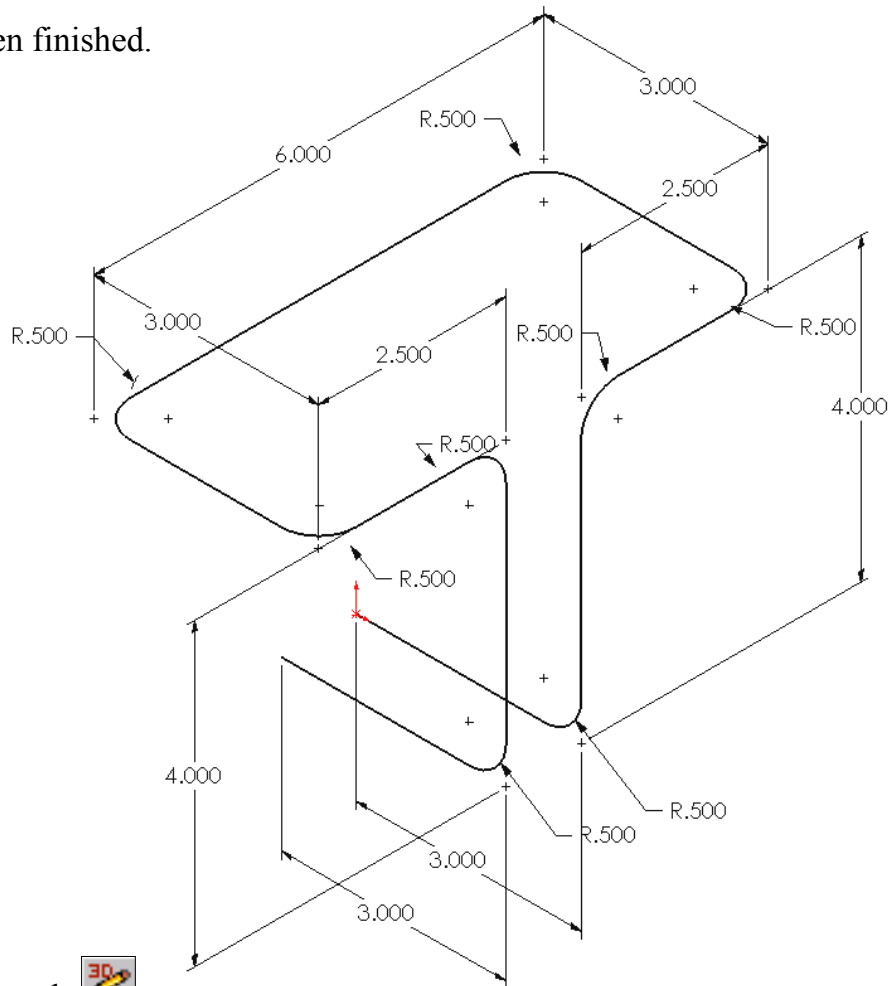
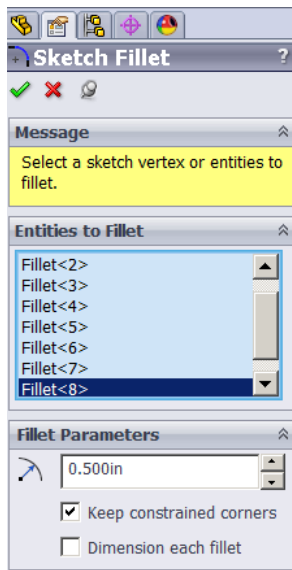


- Continue adding the dimensions as shown, to fully define the 3D sketch.



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.

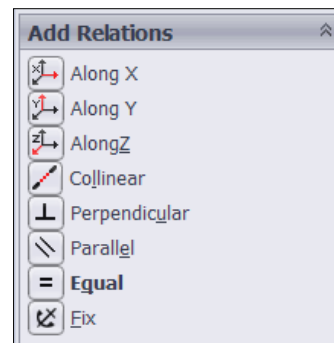


- Exit the 3D Sketch  or press **Control + Q**.





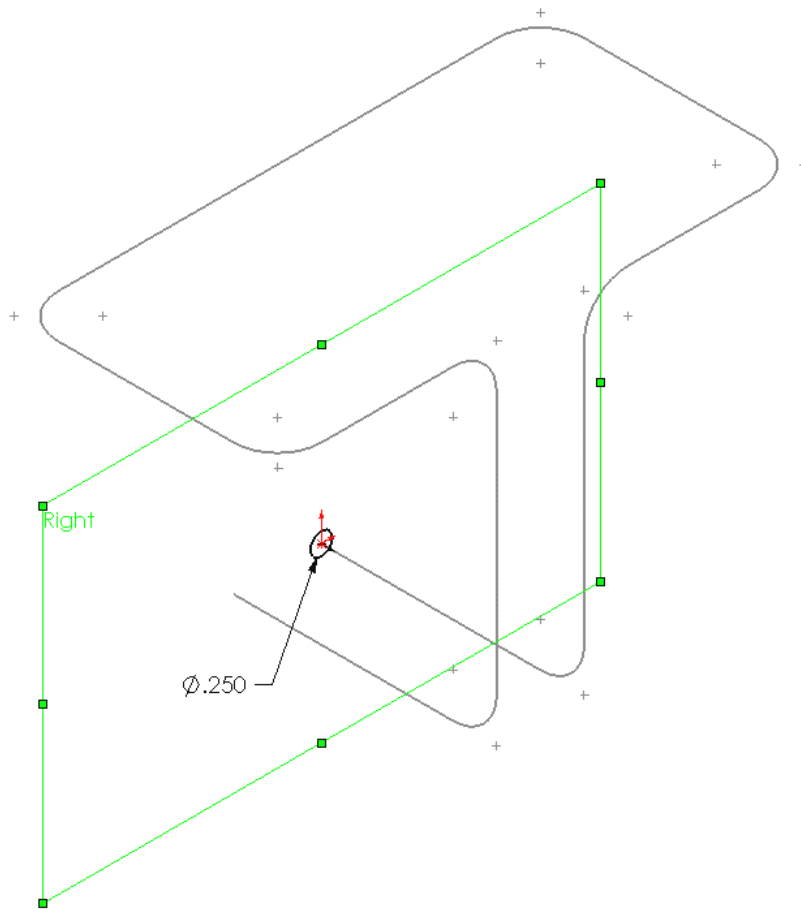
Relations



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.)







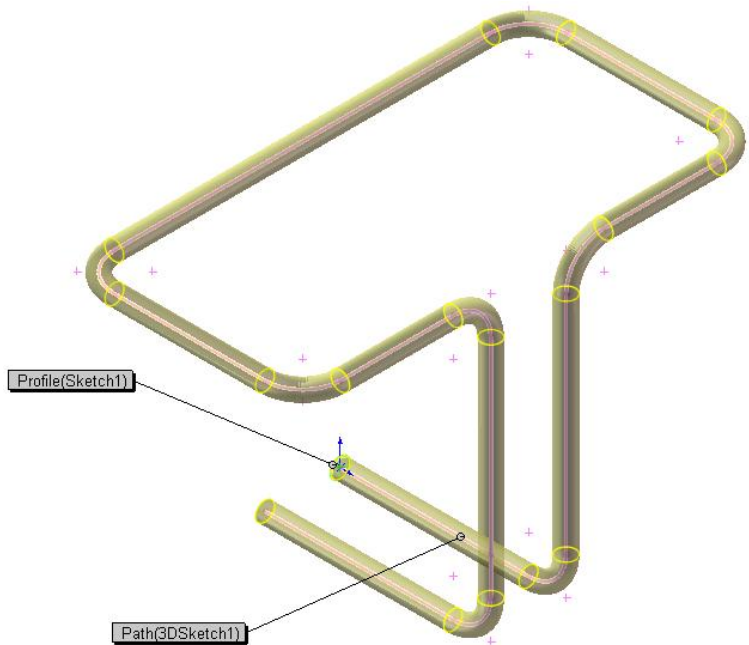
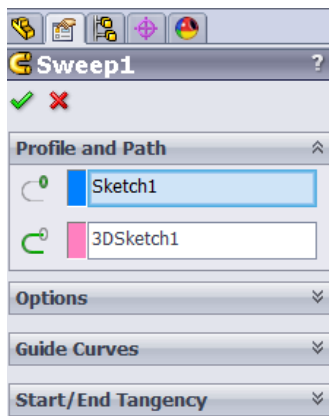
- Add a **Ø.250** dimension  to fully define the circle.
- Exit the Sketch  or select **Insert / Sketch**.

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.*

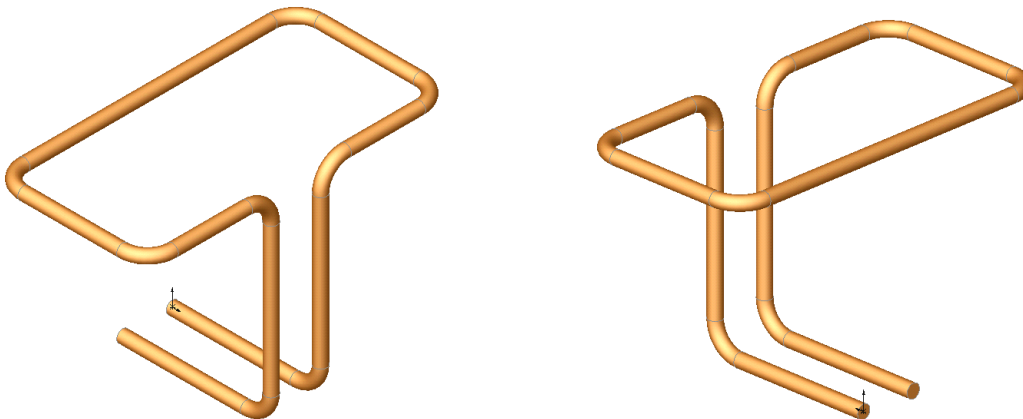
8. Creating the Swept feature:

- Click  or select **Insert / Boss-Base / Sweep**.
- Select the Circle as Sweep Profile  (Sketch1)
- Select 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

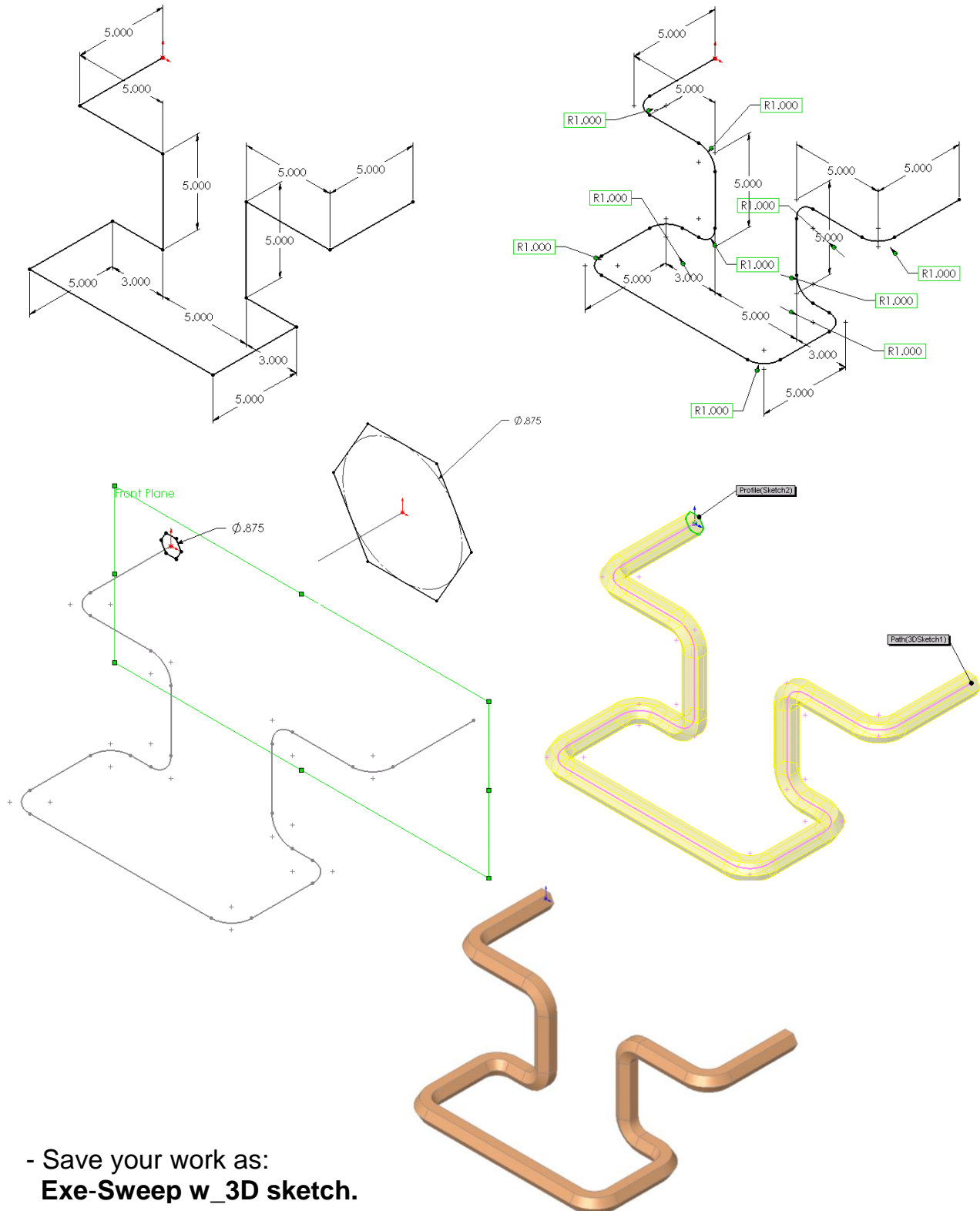
3D Sketch

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

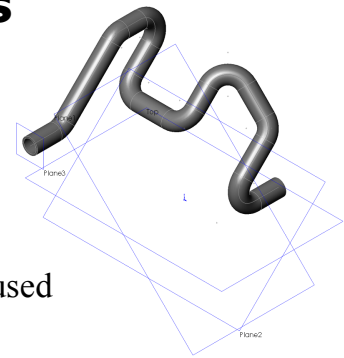
- Create the part shown using 3D Sketch.



- Save your work as:
Exe-Sweep w_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:

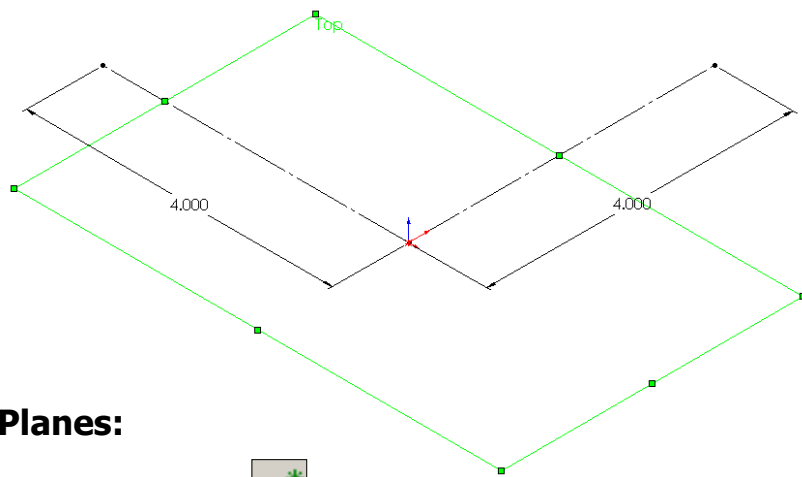
- Select the TOP plane and

open a new sketch .



- Sketch 2 Centerlines 

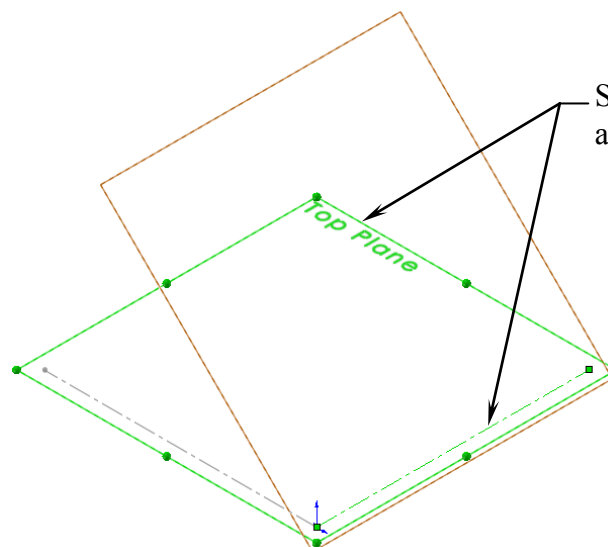
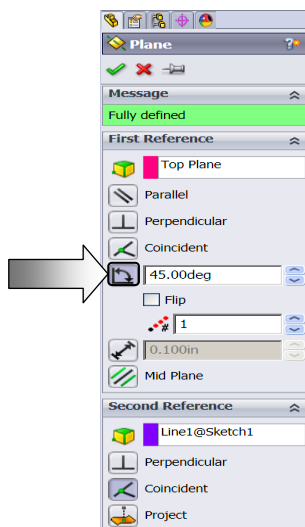
and add Dimensions 

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.

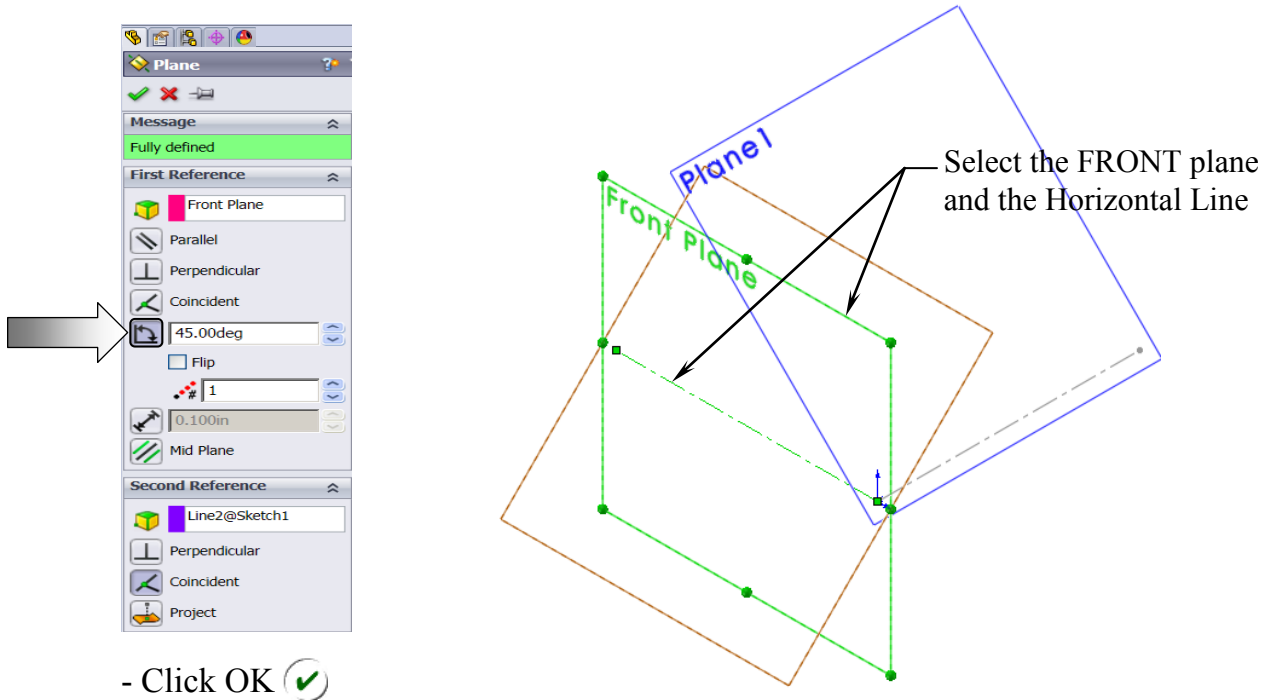


Select the TOP plane
and the Vertical Line...

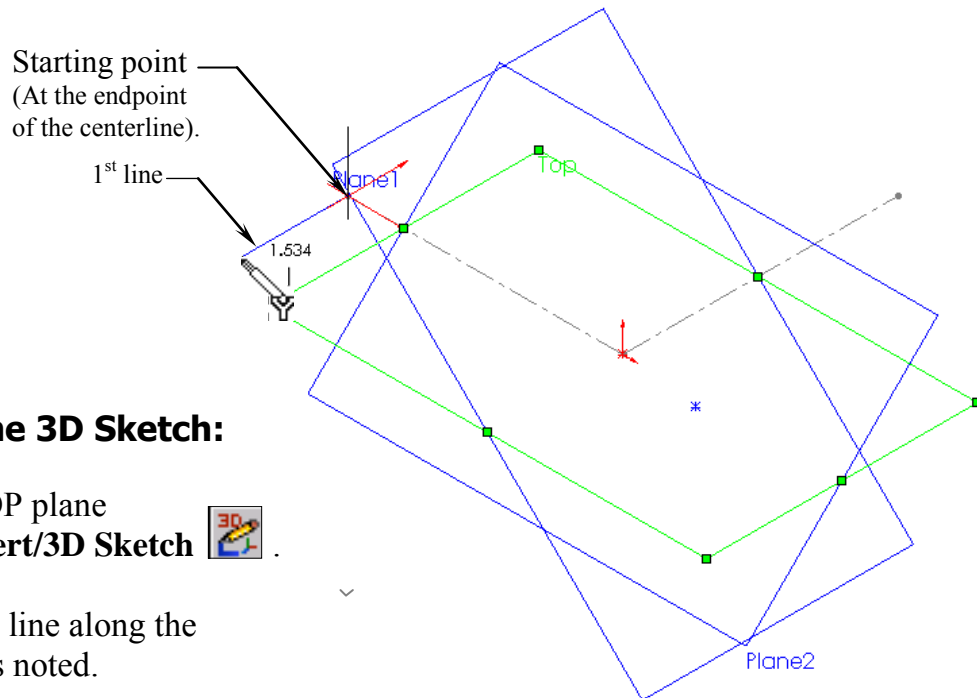
- Click OK 

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 .

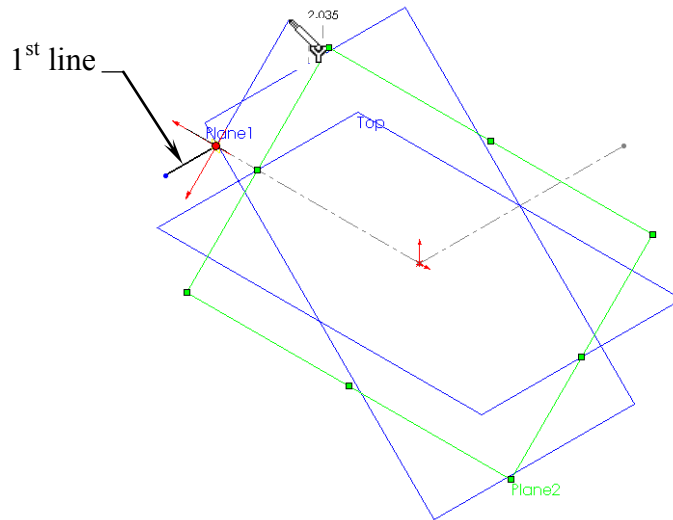


4. Creating the 3D Sketch:

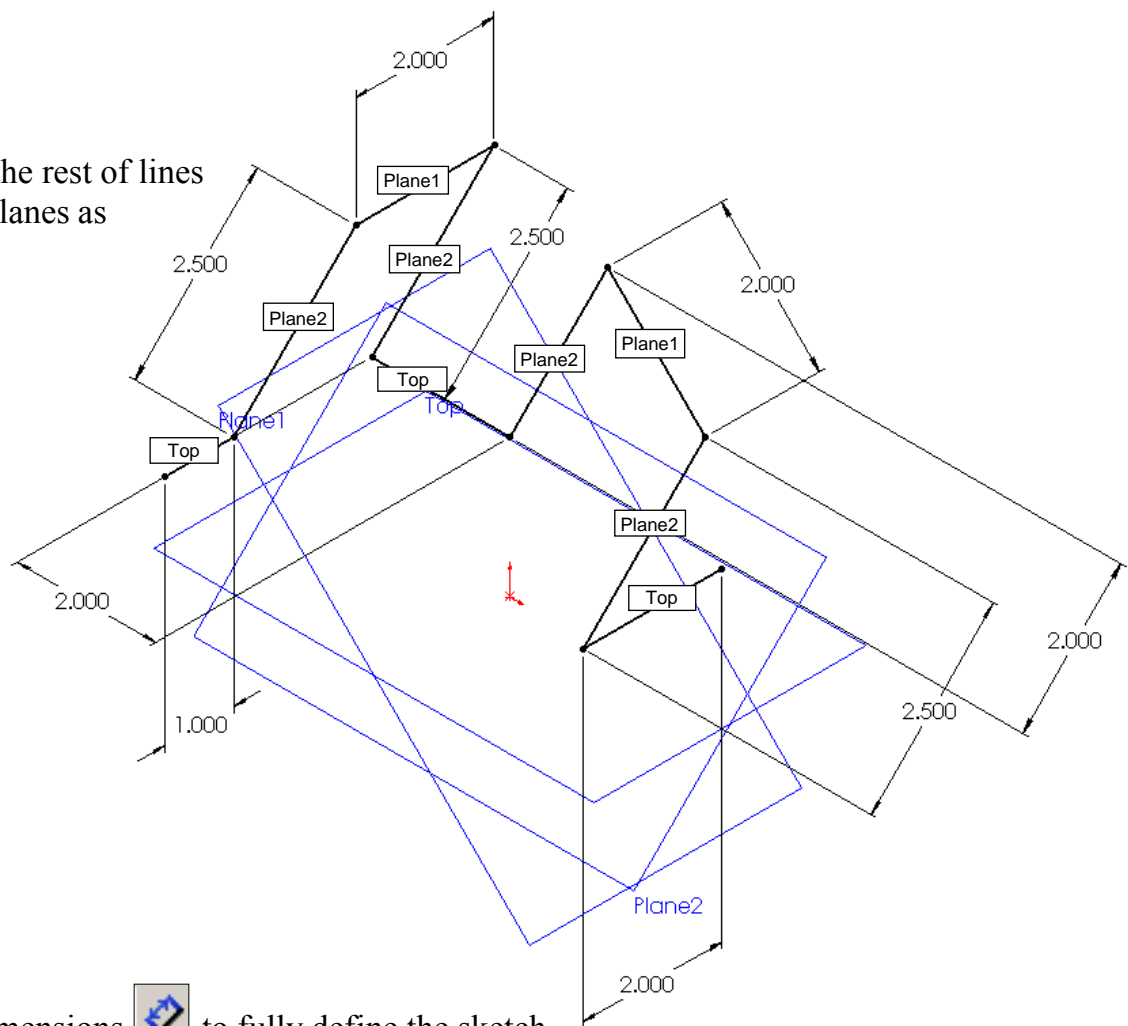
- Select the TOP plane and click **Insert/3D Sketch** .
- Sketch the 1st line along the **Y** direction as noted.


SolidWorks 2011 – 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 symbol).



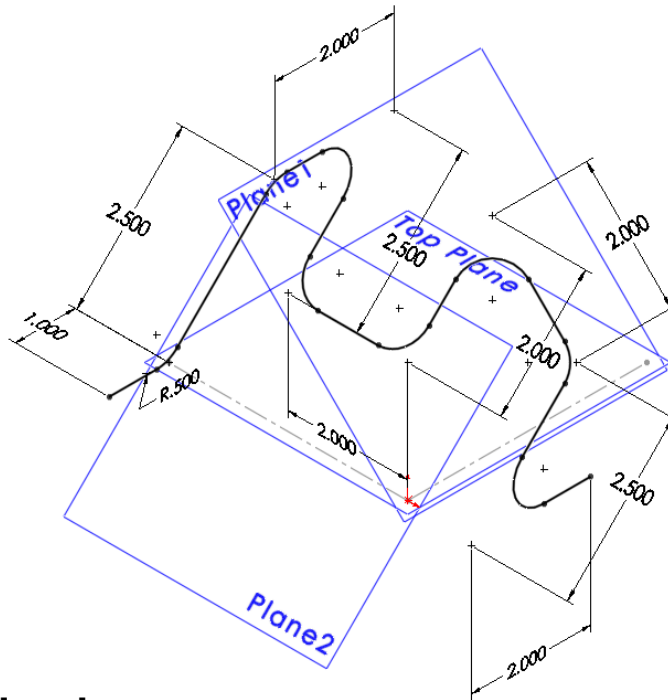
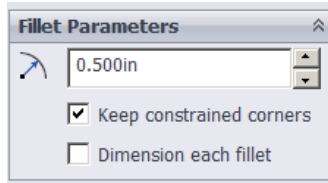
- Sketch the rest of lines on the planes as labeled.




- Add Dimensions  to fully define the sketch.

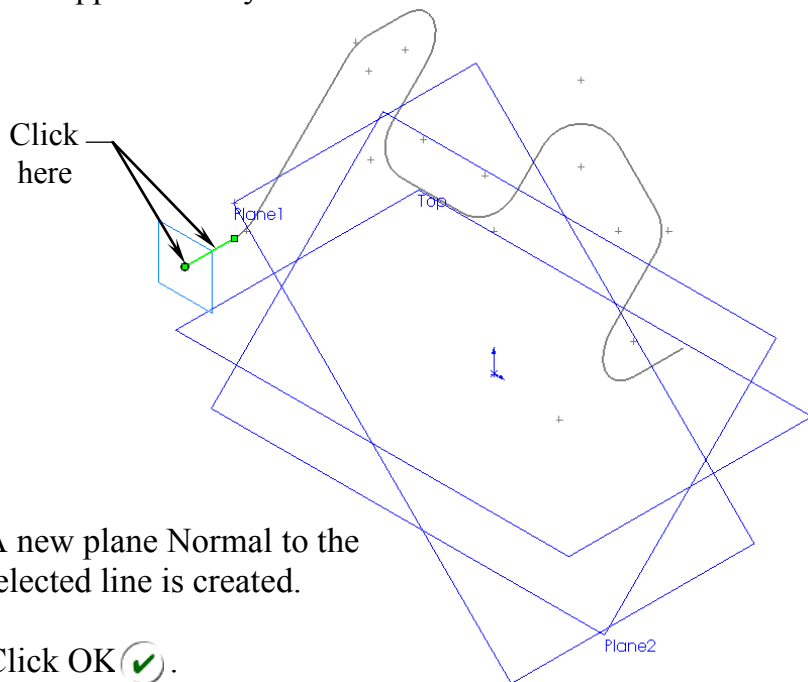
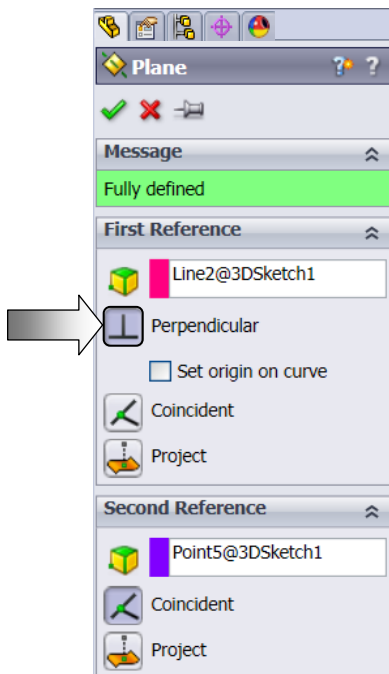
SolidWorks 2011 – Advanced Techniques – 3D Sketch


- Add **Sketch Fillets**  of **.500 in.** to all corners.




5. Creating a Perpendicular plane:


- Select **Insert/Reference Geometry/Plane** .
- Click the **Perpendicular** option.
- Select the line and its endpoint approximately as shown.

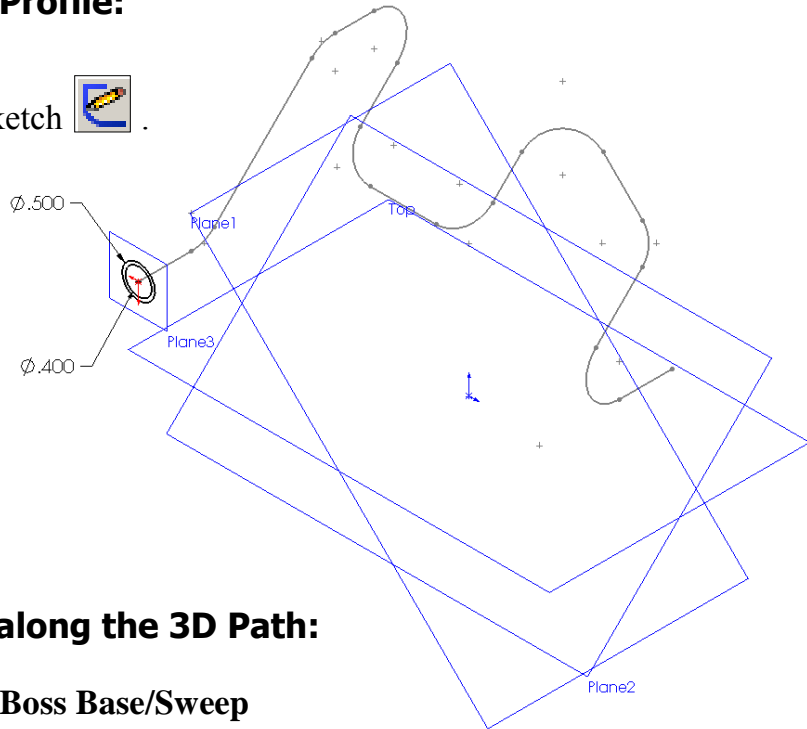


- A new plane Normal to the selected line is created.
- Click OK .




6. Sketching the Sweep Profile:

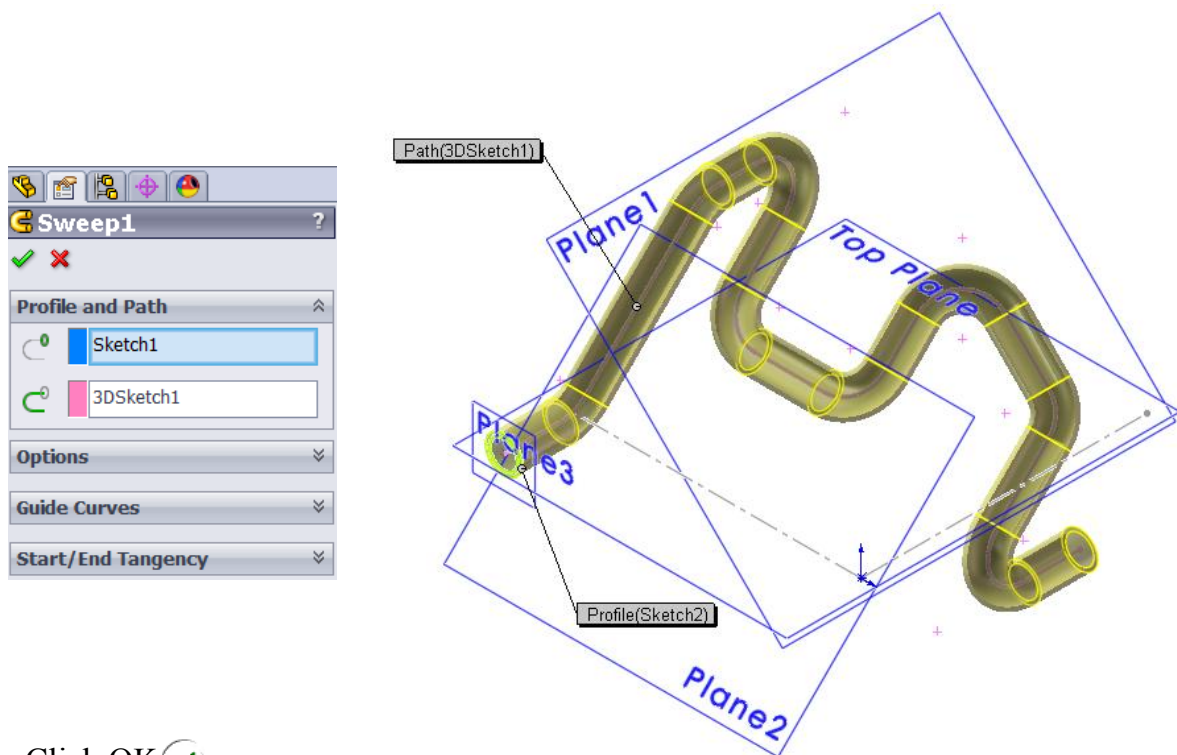
- Select the new plane (Plane3) and open a new sketch .

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



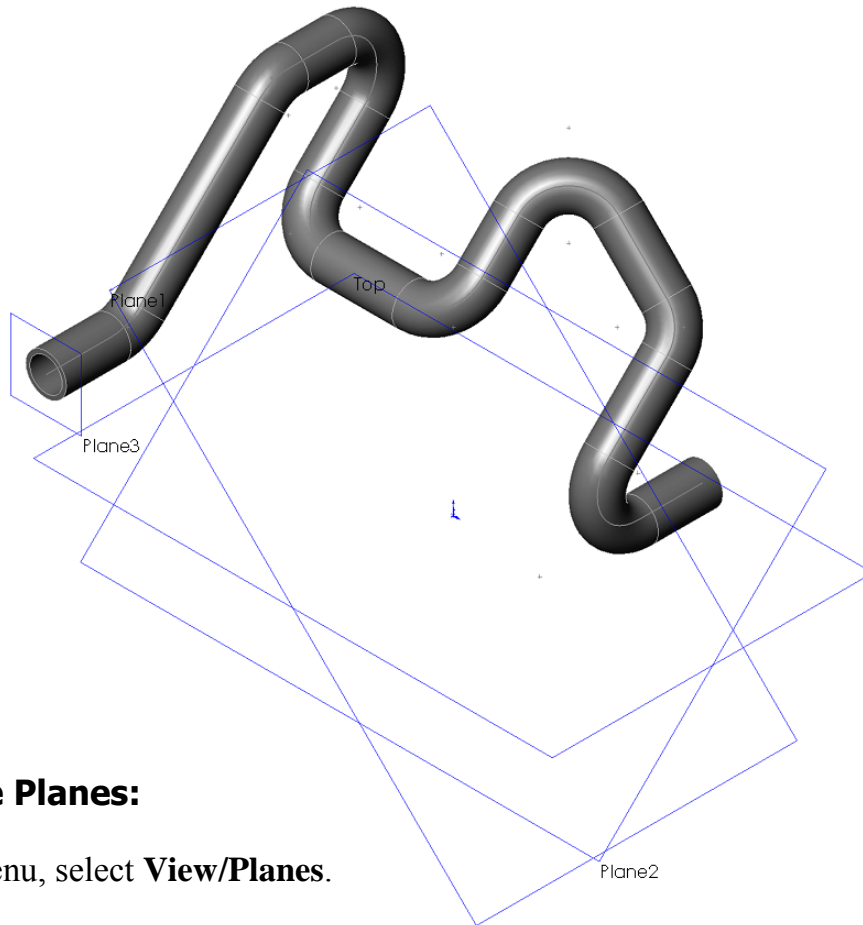
7. Sweeping the Profile along the 3D Path:

- Click  or Select **Insert/Boss Base/Sweep**
- Select the Circles as the Sweep Profile .
- Select the 3D Sketch as the Sweep Path .



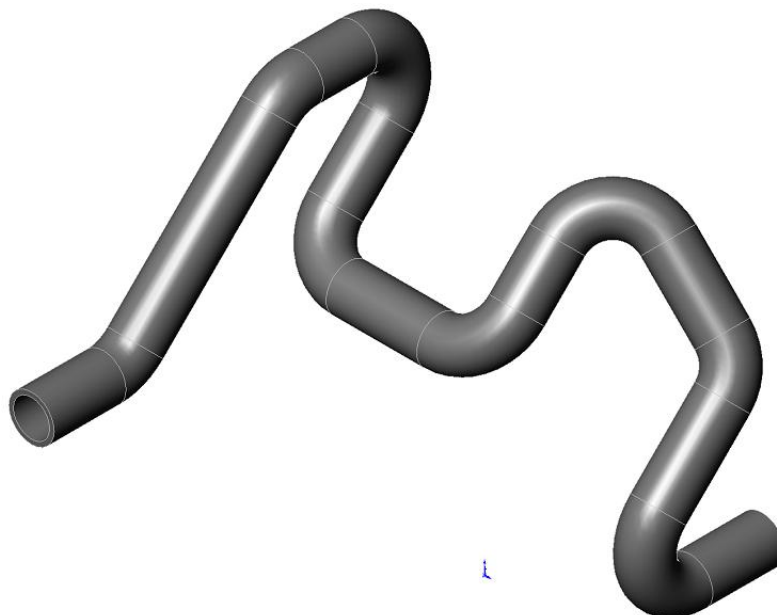
- Click OK .

- The resulting Swept feature.



8. Hiding the Planes:

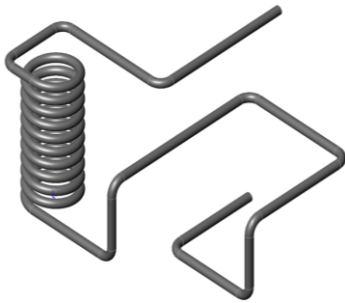
- From the menu, select **View/Planes**.
- The planes are temporarily put away from the scene.



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.

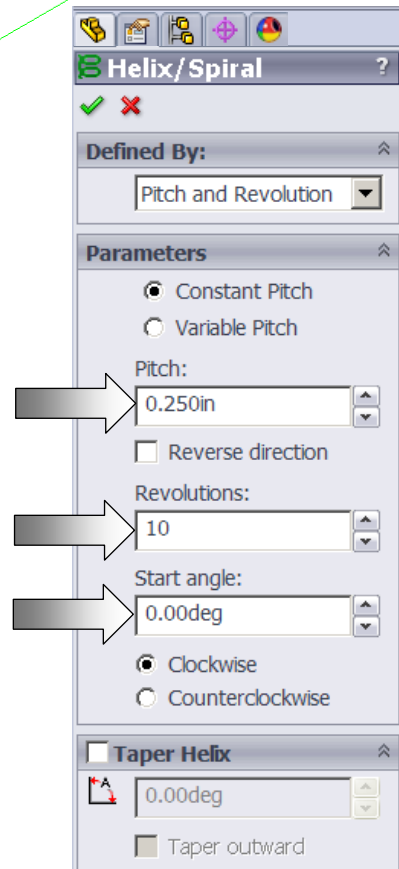
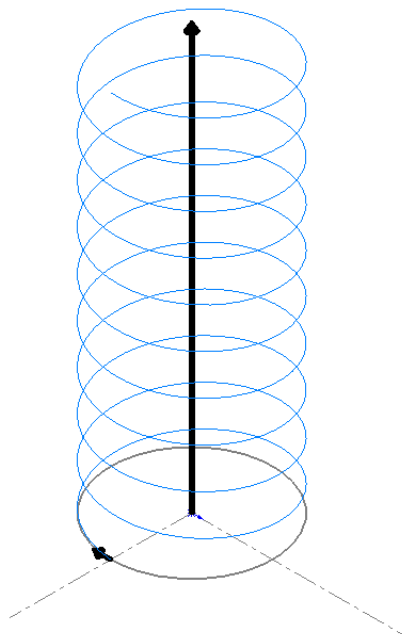
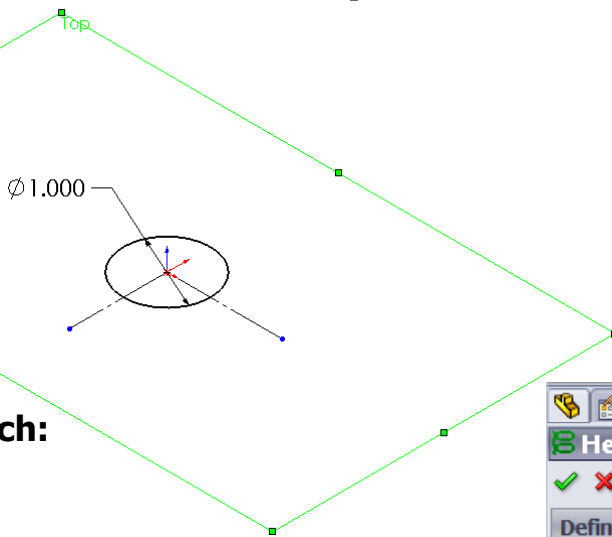
The following exercise demonstrates how several 3D Sketches can be created and combined into 1 continuous Composite Curve for use as a Sweep Path.

1. Creating a 2D sketch:

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


2. Creating a Helix:

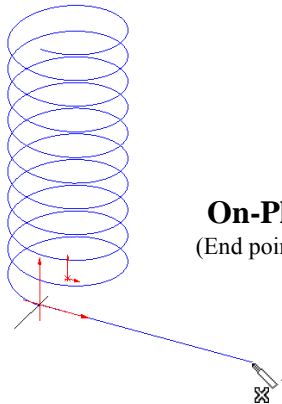
- Select **Insert/Curve/ Helix-Spiral** 
- Pitch: **.250 in.**
- Revolution: **10**
- Starting Angle: **0 deg.**
- Click **OK** .



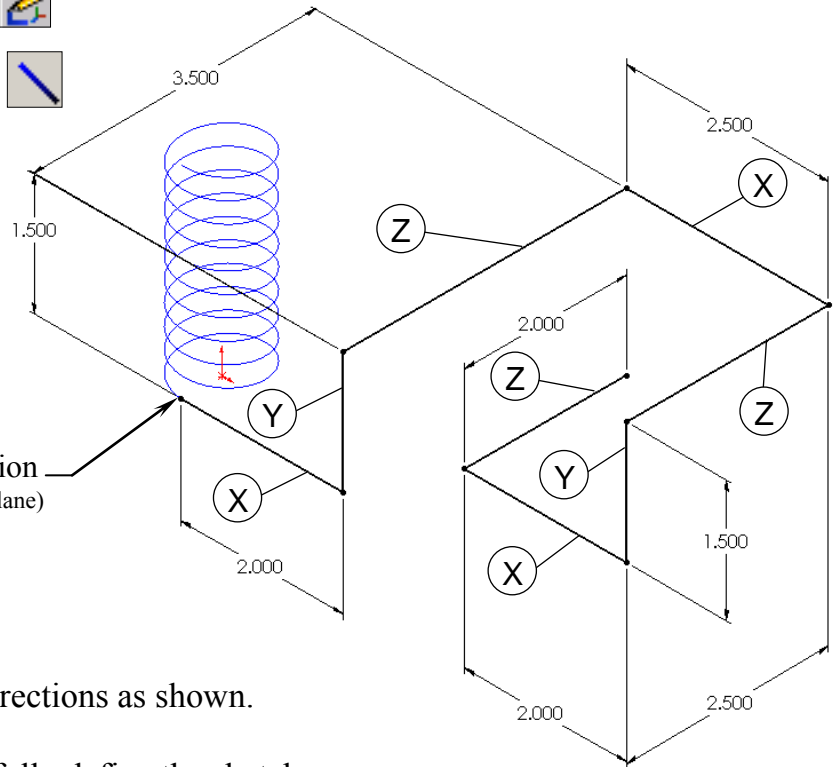
3. Creating the 1st 3D sketch:


- Select **Insert/3D Sketch** 

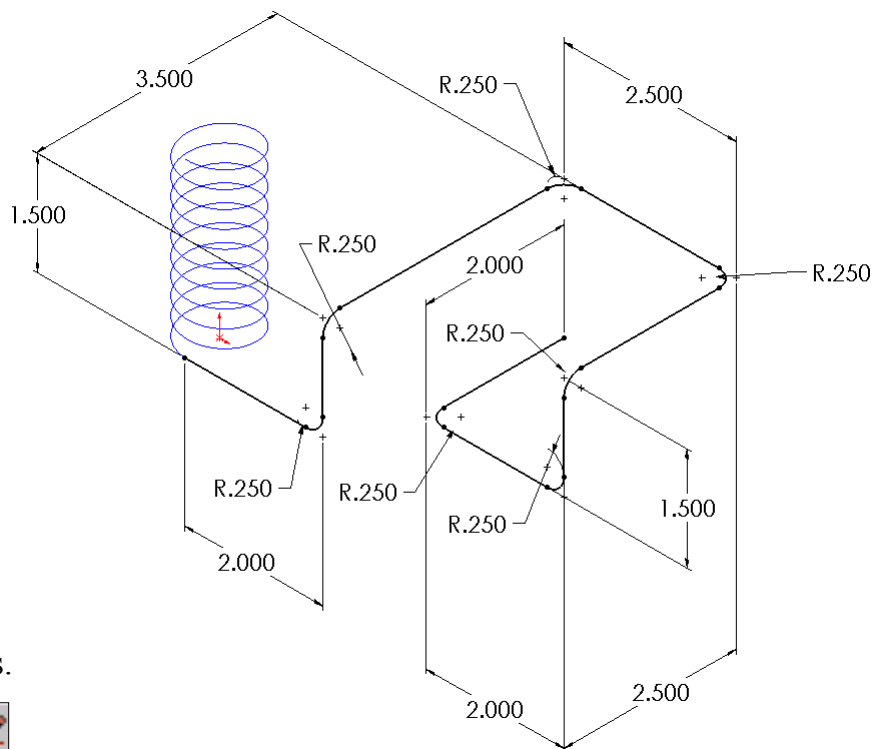
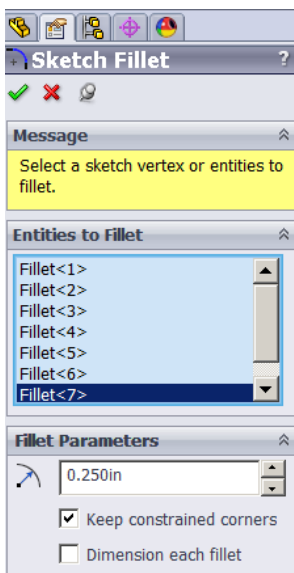
- Select the Line command  and sketch the 1st line along the X direction.




On-Plane relation
(End point & Right plane)





- Add other lines in their directions as shown.
- Add Dimensions  to fully define the sketch.

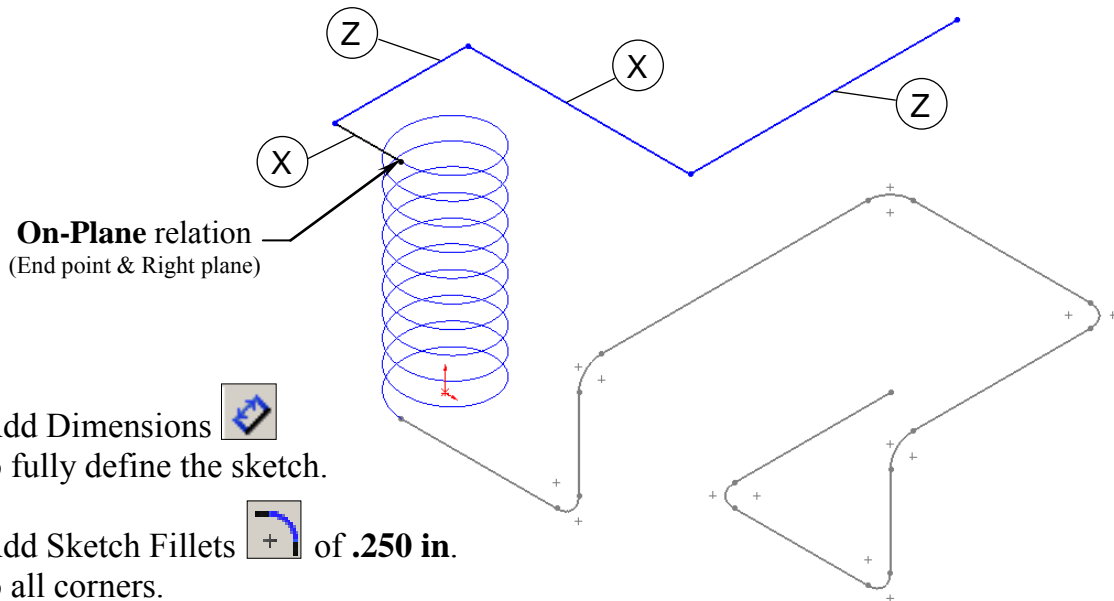




- Add Sketch Fillets  of **.250 in.** to all corners.

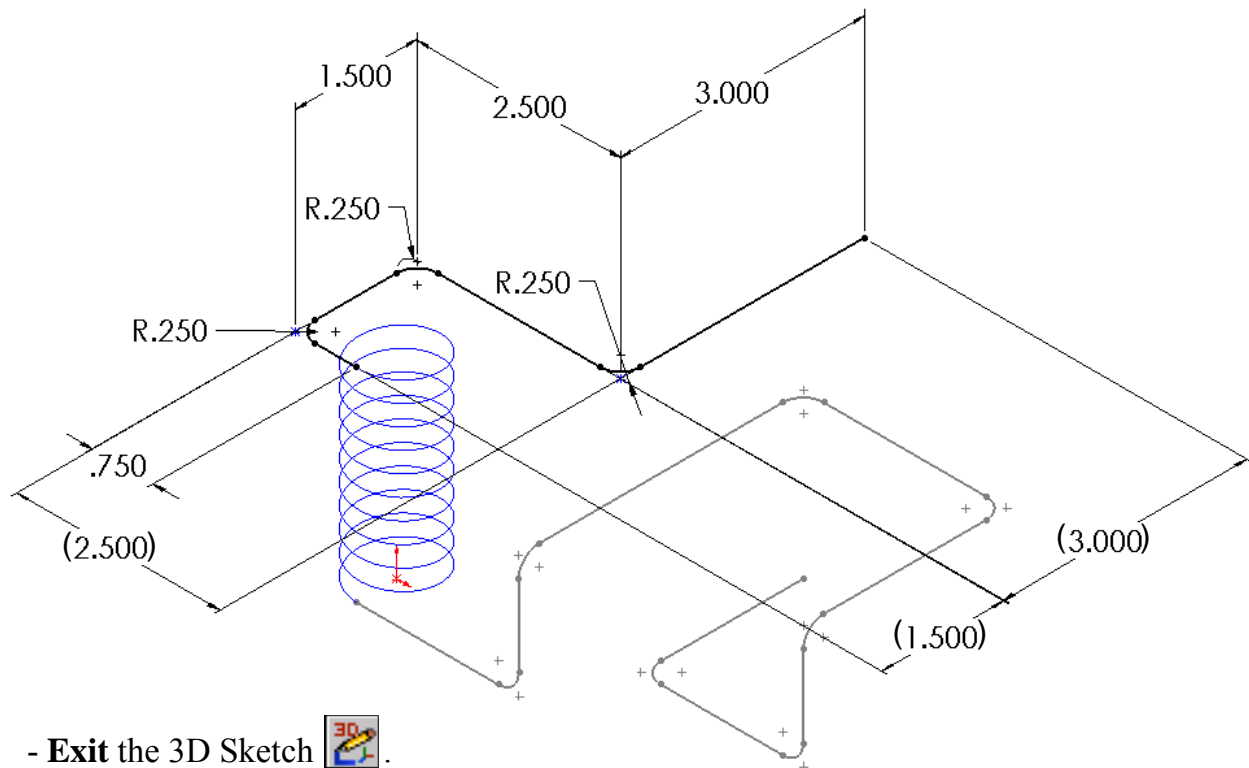
- **Exit** the 3D Sketch .

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.



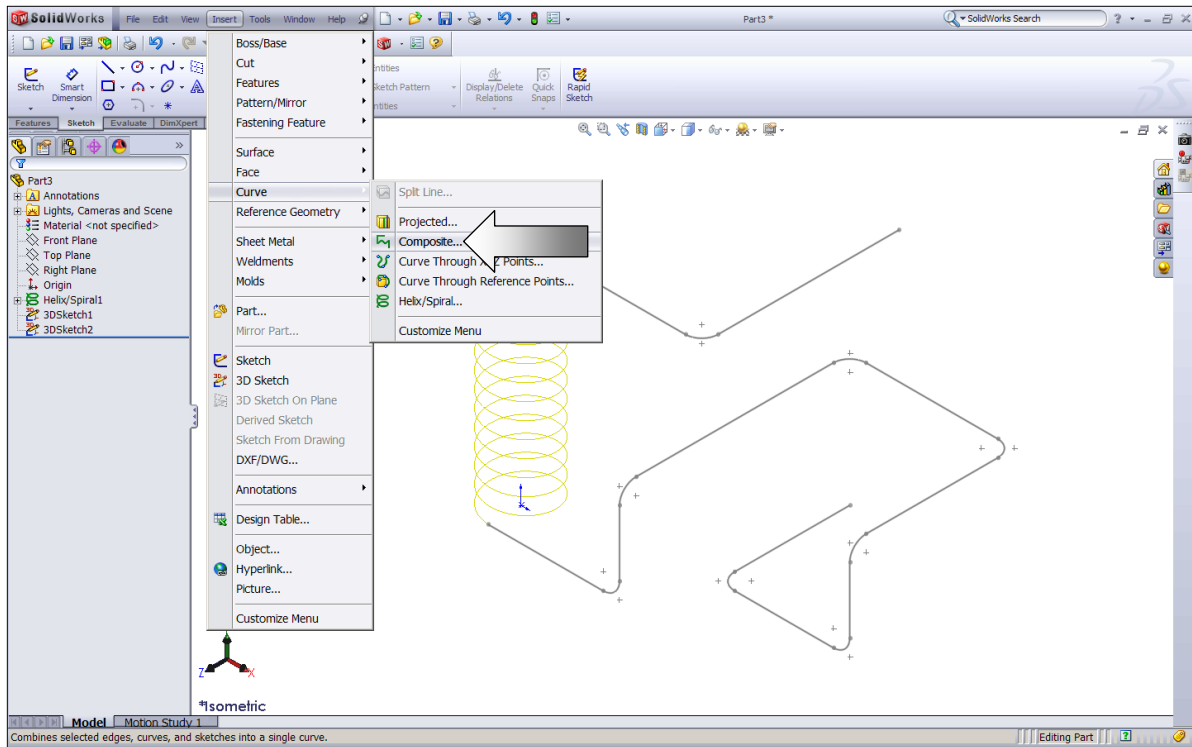
- Add Dimensions  to fully define the sketch.
- Add Sketch Fillets  of **.250 in.** to all corners.



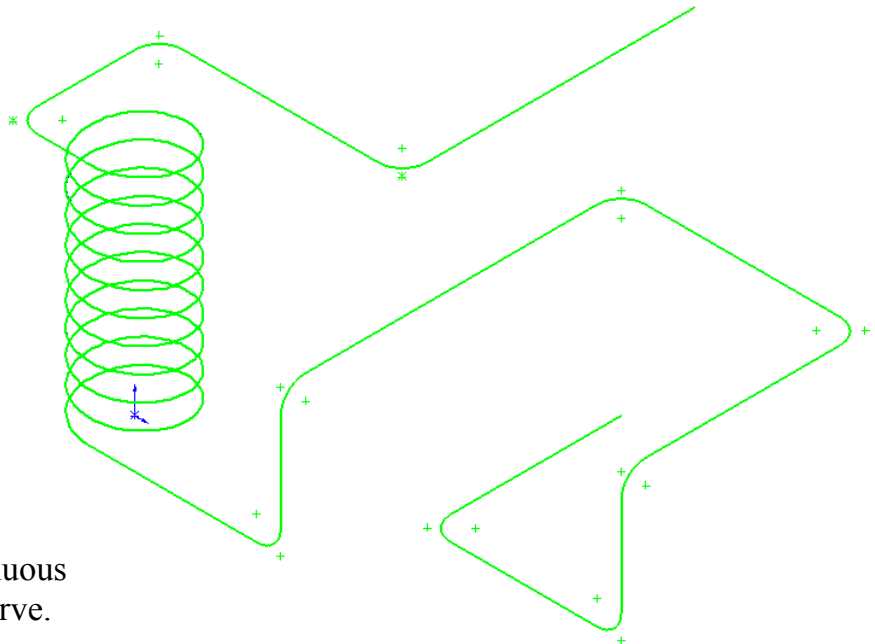
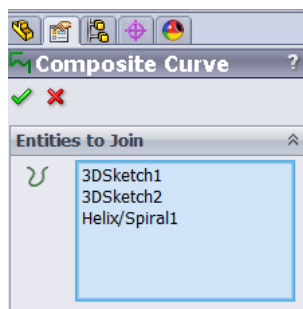
- **Exit** the 3D Sketch .


5. Combining the 3 sketches into 1 curve:

- Select **Insert/Curve/Composite** , or click the Curves button from the Feature toolbar.




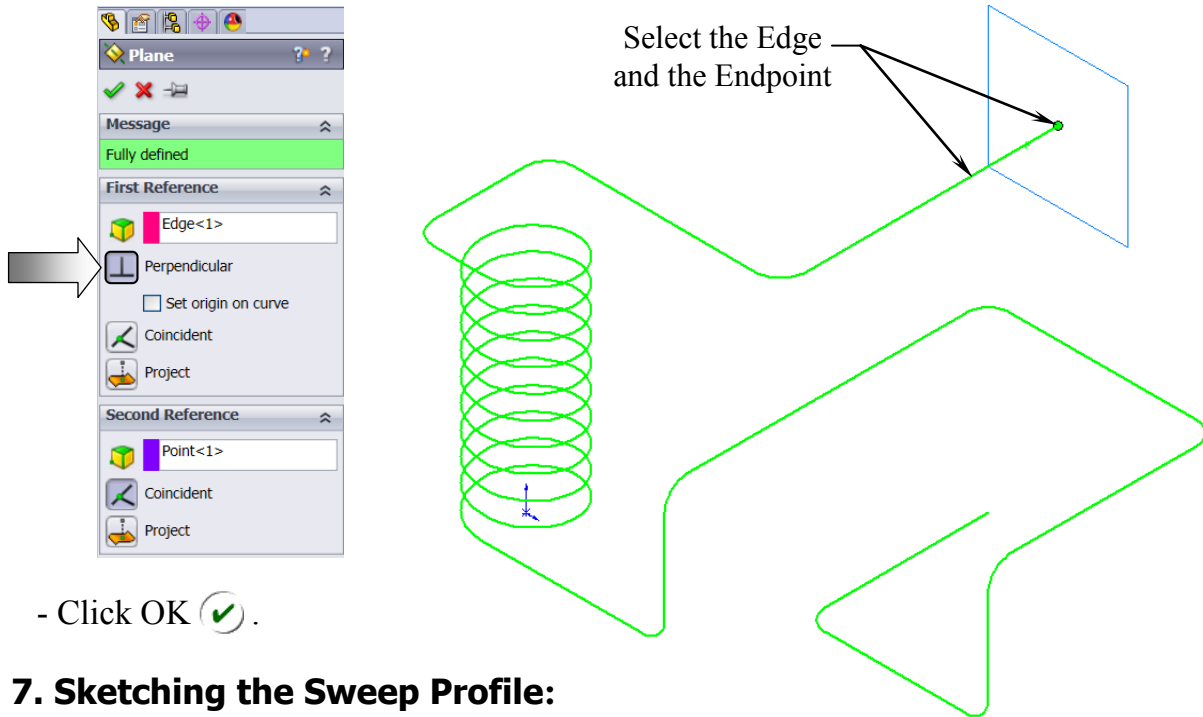
- Select the 3 Sketches either from the Feature Manager tree – or – directly from the graphics area.



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




6. Creating a new work plane:

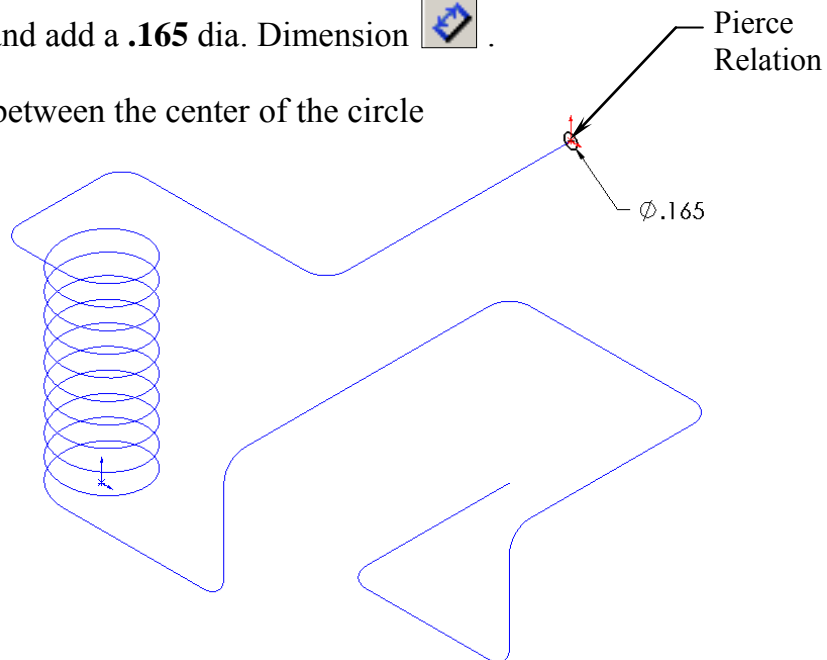
- Select **Insert/Reference Geometry/Plane** .
- Click the **Perpendicular** option and select the edge and the endpoint as noted.



- Click OK .




7. Sketching the Sweep Profile:

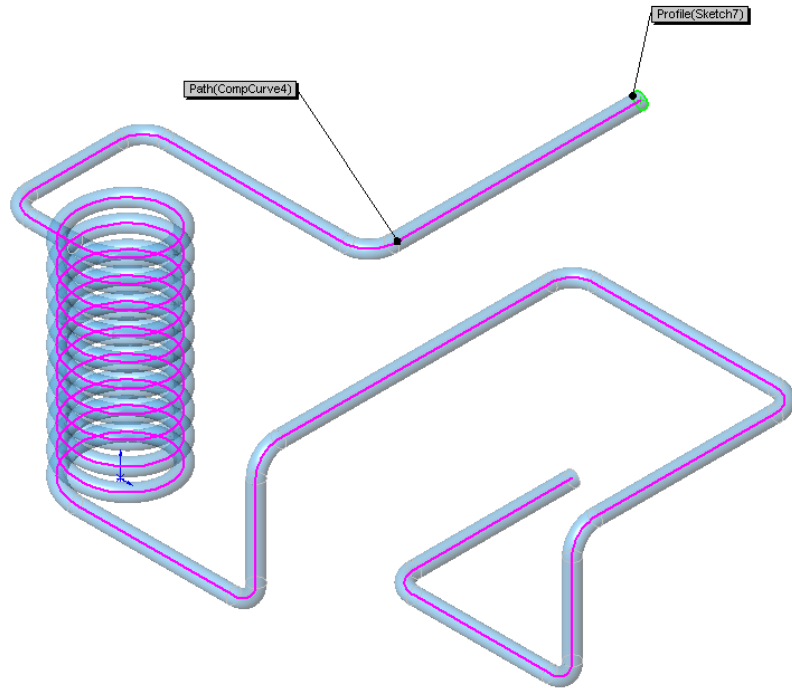
- Select the new plane (Plane1) and open a new sketch .
- Sketch a Circle  and add a **.165** dia. Dimension .
- Add a Pierce relation between the center of the circle and the curve.



- **Exit** the Sketch .

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**.

