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# Curve from Sketcher - II

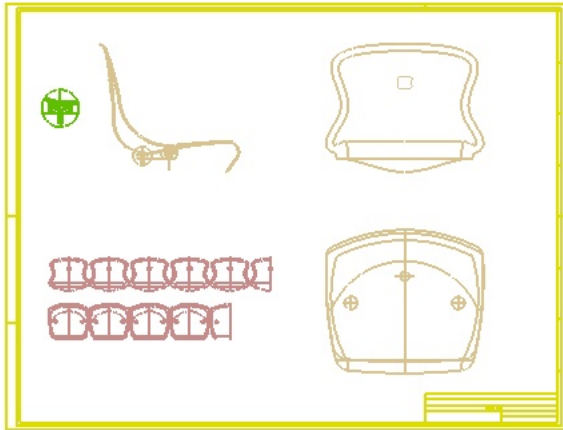
This task will show you how to generate 3D curves from the available 2D drawings and how to analyse them. The final objective of this webtraining task is to generate a 3D profile of a chair that will be completed using the surface Modeling techniques.

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## 1. Step 1 - Getting Started

In this step ,we will create 3D curves starting with drawing entities.



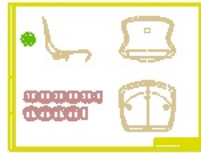
### NOTE:

With a double click on the exe file you can run the webtraining session. ThinkDesign will be open with the right model to start..

If request to open a file, you can find it in the C:\MyTraining path.

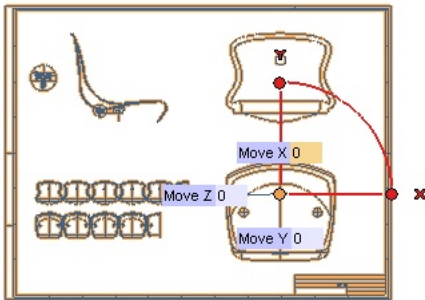
- **Open** E3 reference file in thinkdesign from the downloaded folder which is typically the files folder inside the corresponding task folder wherever it is downloaded.
- Click **Fit View** or use the short key F to get all the entities in the drawing on screen. .
- Open Option/Properties and in Document Property - Work Plane, check Show box and uncheck Transparent Plane box.
- Hit OK followed by F to **Fit View**

We can see that the work plane origin is in the left corner of the graphics screen and the drawing in the bottom right corner.

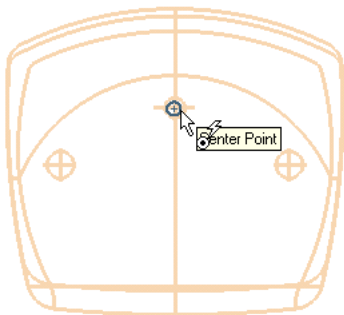


Let's place the drawing at proper position. We will do this using **Move Copy Entities** command.

- Start the **Move Copy Entities** command.
- Right click in the Graphics area for the context menu and **Select All** entities.
- The Entities is checked. Right click in graphics area and in the context menu select Continue.



- Click on Start Point and select the arc center in the top view by the **Snap to Arc Center**. The start point in the selection list will turn green.

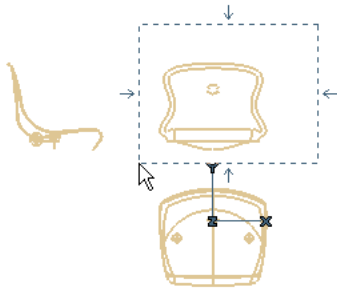


- Select the **Work Plane Origin** for End Point
- Select OK to exit.

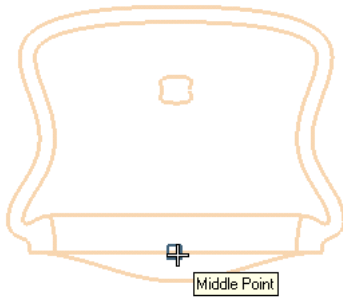
Now, we will try to make our work simpler by hiding entities that we do not need on screen at present.

- Go to **Format** → **Layers** from the main menu to open the layers dialog.
- Uncheck the Output box for Layer 1 and Layer 5 to keep their Visibility off.

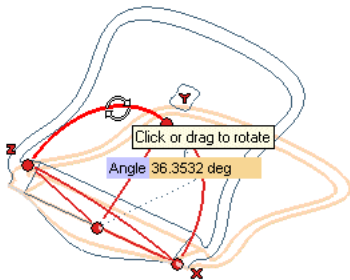
- Start the **Move Copy Entities** command.
- Select all the entities of the Front view.



- Select the mid point of the Horizontal Line shown below by using **Mid Point Snap**. This will be the Start Point.

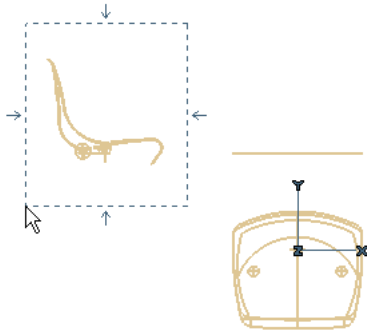


- Rotate the entities along X axis and enter the Angle as 90 degrees.

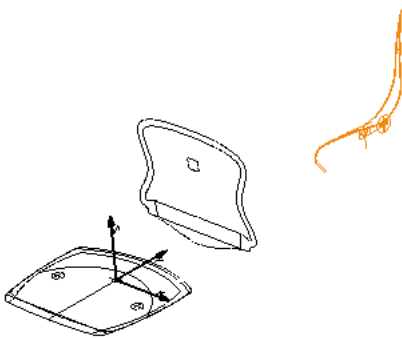


Once again we will use **Move Copy Entities** command to change the orientation of the side view.

- Start the **Move Copy Entities** command.
- Now select the side view.



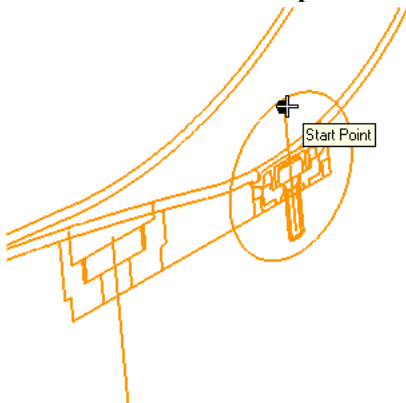
- Rotate the view to align on YZ plane as shown in the image below.



- Hit Apply.

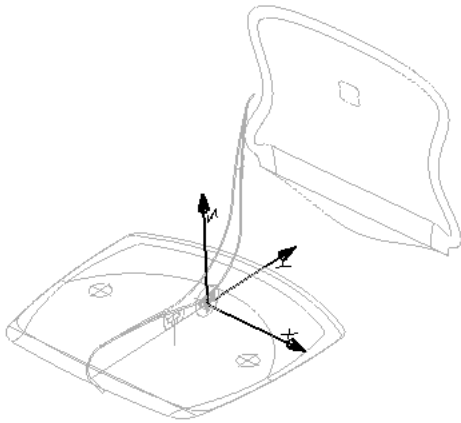
We will have to relocate the side view to a proper place, say 0,0.

- Start the **Move Copy Entities** command.
- Select the side view.
- Use the **End Point Snap** to select the end point of the centerline as the Start Point.



- Select the End point by clicking on the **Work Plane Origin**.

The final alignment of the views will be as shown below.



Notice that at this stage, the Front and Side views are not aligned in Z axis. We will fix this.

- Go to **Tools** → **Info** → **Two Entities** and select the start point of the side view by placing the cursor on it.



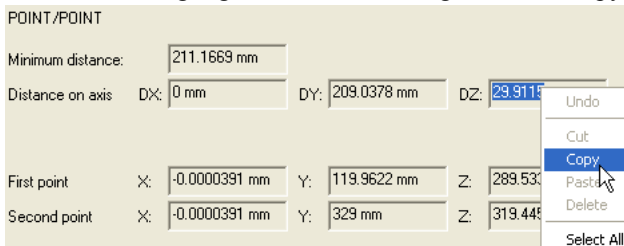
- Select the second point by using **End Point Snap** as seen.



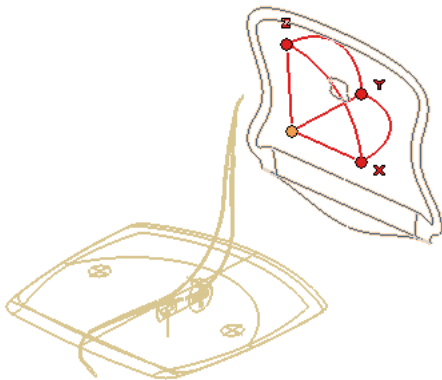
The results are displayed below.



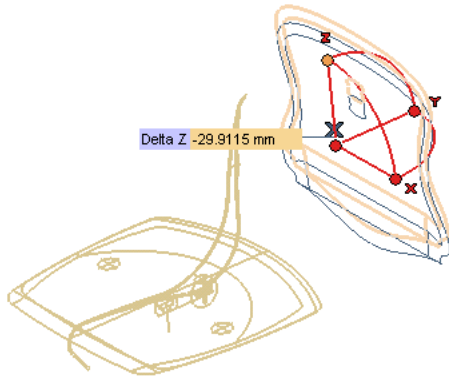
- The highlighted distance DZ shows the difference in Z axis, which we need to use for shifting the front view.
- Select the highlighted distance and right click to Copy it.



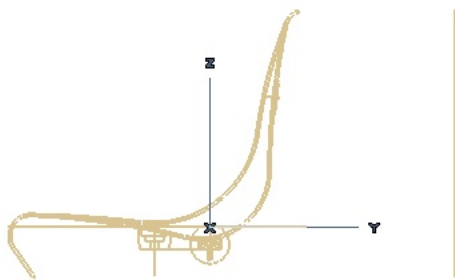
- Start the **Move Copy Entities** command.
- Select the Front view.



- Right click on the Z value to paste the value we copied earlier. Since we have to move the view down, enter the negative value to it.



Select **Right View** and view placement now.



To cross verify the alignment , use **Tools** → **Info** → **Two Entities** and check again the Dz value.

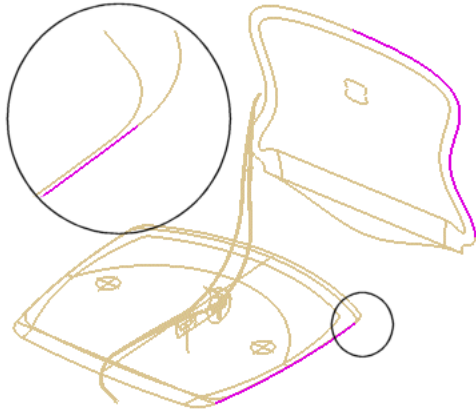
**NOTE:**

Same movement can be done using directly the **Move Copy Entities** command given start and end points, to destroy X and Z dialog and move along Y.

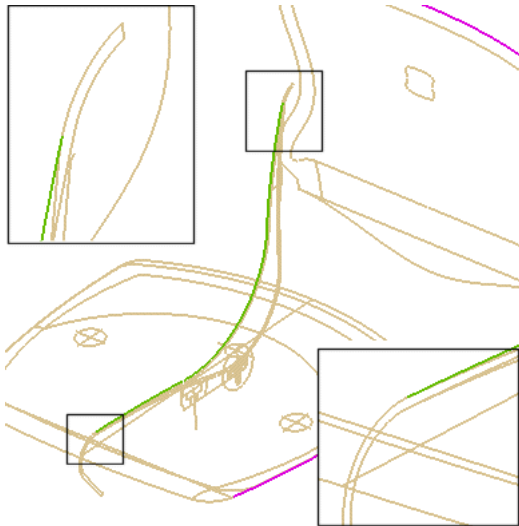
## 2. Step 2 - Analyze the curves

In the side view, we have two main sets of curves. The curves forming the shape of the left and right sides (viewed on edge) and the shape in the center of the chair. Let's make the three edge curves green. The side view shows the thickness, so be sure to select the outer/upper surface curves (As seen in the X axis direction of the image below). We're just going to change the three main curves, so don't worry about the fillet curves.

- Pick the violet curves as shown below and change their graphic properties.
- Set Color 6, Width 2 and Layer 0.



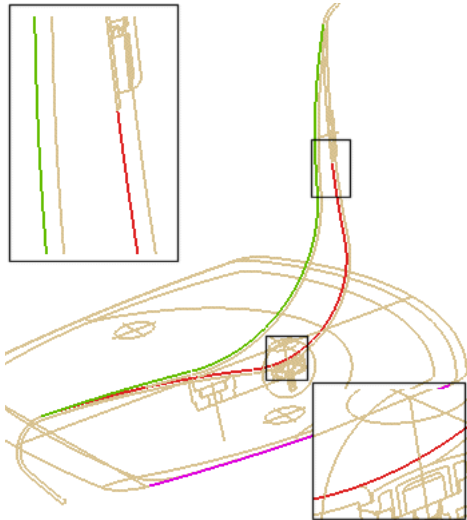
- Pick the green curves, as shown in the image below and change their graphic properties.
- Set Color 3, Width 2 and Layer 0.



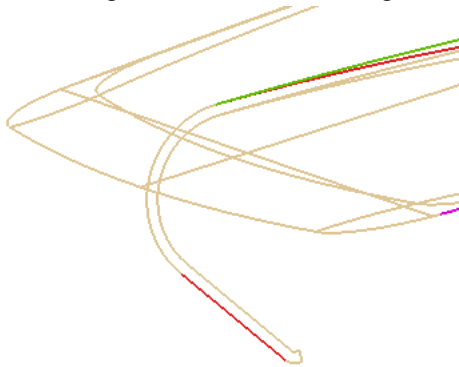
Now we'll work on the center shape curves. They are broken up into a number of segments, so we need to be careful here. We'll use the tool tips to get some information about the curves.

- **Zoom In** to the upper portion of the chair to get a good look. Notice that the arcs are broken by the hole in the chair back.
- Select the red curve curves in the image below and change their properties to Color 28, Width 2 and Layer 0.





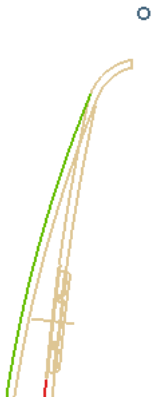
Lets change the last line to red along with the other property changes as Color 28, Width 2 and Layer 0.



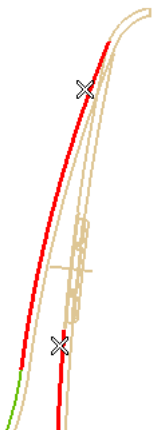
We need to connect the red and green lines in the side view. We will use **Trim/Extend Curves with Limits** command.

First ensure that the Work plane is On. Until now we were working with the Work plane aligned to Set to World. The Work plane orientation now needs to be changed.

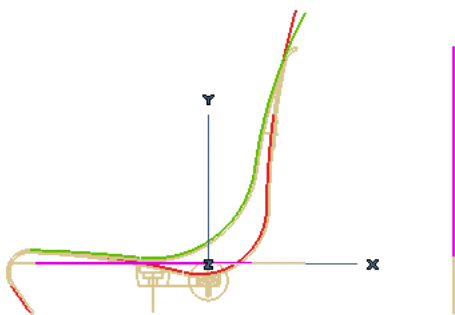
- Pick the Work plane, right click and hit Edit.
- Rotate the work plane by 90 degrees along X axis and 90 degrees along Y axis.
- Hit and OK.
- Start the **Trim/Extend Curves with Limits** command.
- Set the Boundaries to Points.
- Click on the point just above the Curves in the Side View as shown.



- Click on the green and red lines to extend them to the point we have selected.
- Click Cancel.

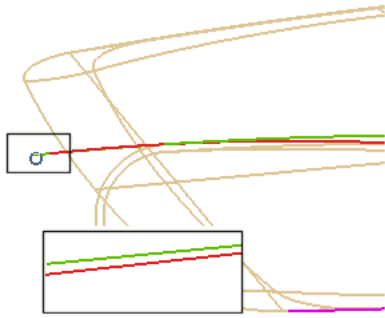


The lines get extended to the point selected.



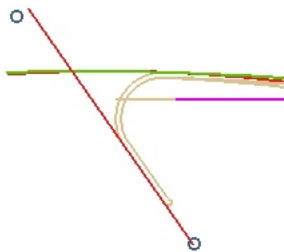
Now, we are still in the command and we can use the same logic for extending other curves.

- Click on the screen to set the limit point maintaining a clearance from the front of the chair.
- Right click and hit Continue from the context menu.
- Select the green and red lines one by one to extend them to the selected limit point as seen below.

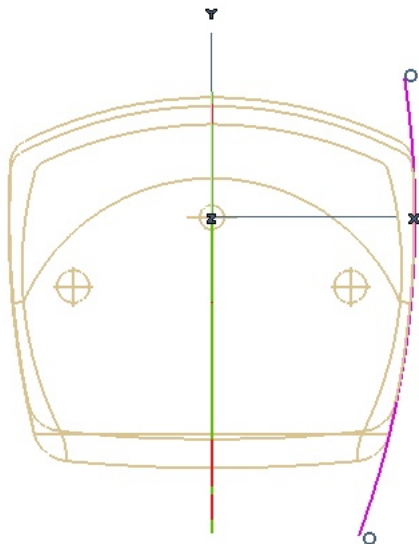


Once again we need to repeat the procedure for extending the red line down below the two lines we just extended.

- Select the point just above the two lines as well as at the point near the other end of the red line as shown for limit points so that the Red line is extended in both the directions.

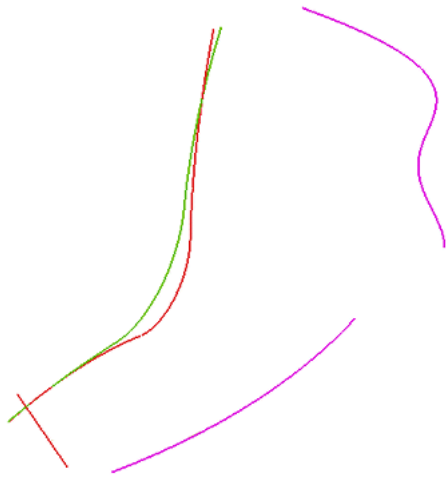


We have extended the green and red lines. The magenta line in Top view also has to be extended. The work plane has to be reoriented again. Right click on the work plane and Set to world and use again **Trim/Extend Curves with Limits**.



### 3. Step 3 - Curves 3D

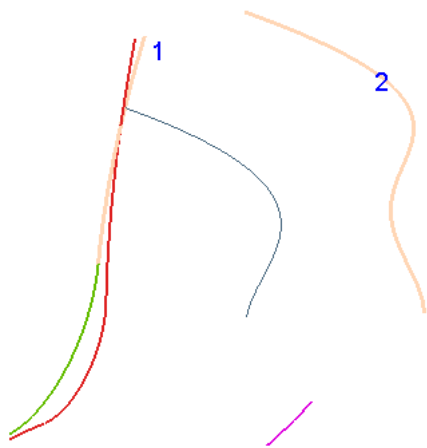
Let's get started on the 3D boundary curves for the chair. We'll use **Two D to Three D Curve** command to generate these curves from the extended 2D curves.



- Move all changed color entities into a different layer and unhide all others.
- Start by setting the Color to 1 (if it isn't already) and the line Width to 3.

The 3D curve is generated after the second pick and the command remains active.

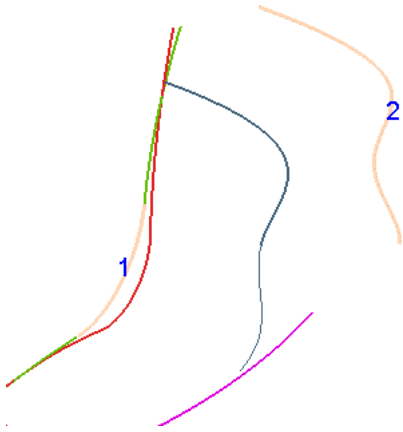
- Start **Insert** → **Curve** → **Two D to Three D** command.
- Select the green line in the Side view as the First Planer Curve.
- Select the first violet line as the Second Planer Curve.



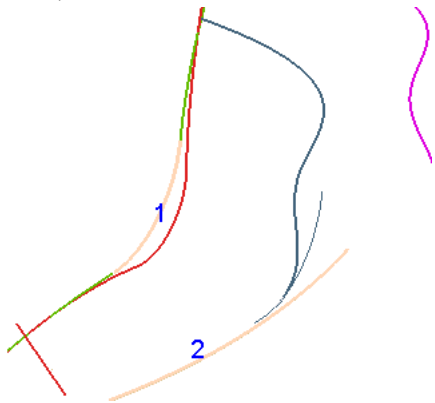
- Hit Apply.

This will retain us in the command. We will create few more 3D curves. For the next curve, select the same magenta curve and then the green curve adjacent to the one which we have selected for the earlier option. Selected curves that are highlighted in Yellow.

- Hit Apply.



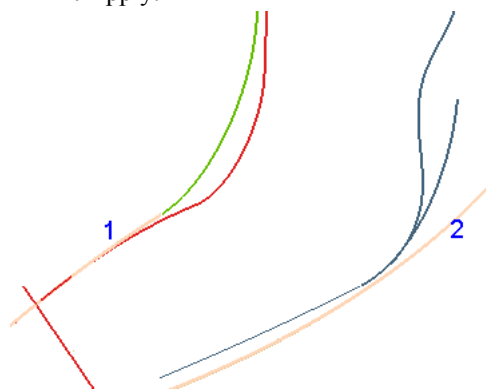
Now, select the **magenta** curve from the Top view and the **green** curve.



- Hit Apply.

We are still inside the command to create the last 3D curve.

- Select the same magenta line and the last green curve. Selected curves that are highlighted in Yellow.
- Hit Apply.

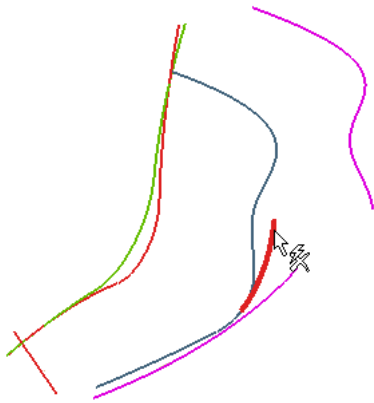


- Hit Cancel to come out of the command.

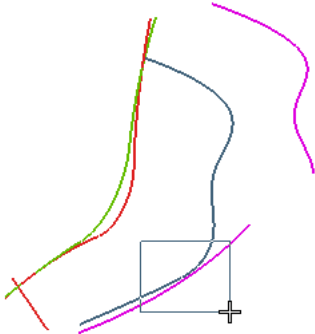
We are through with the creation of the all 3D curves and we need to edit them by using the **Smart Delete** command to remove the excess lines.

- Start the **Smart Delete** command.

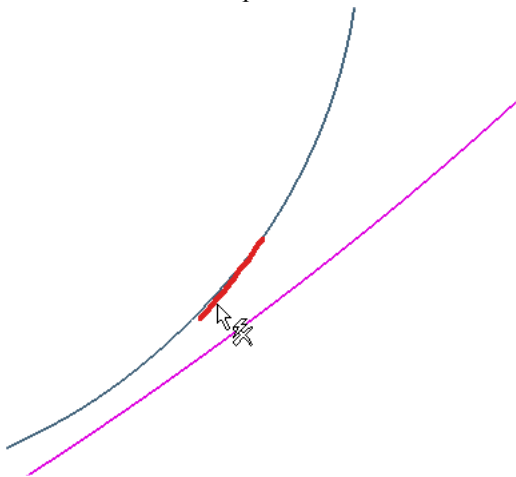
- Click the highlighted (Red) curve and it will be deleted.



Zoom the area as shown:

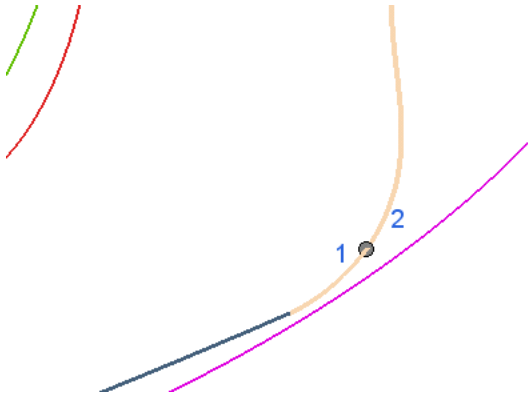


and select the smaller part of the same curve.



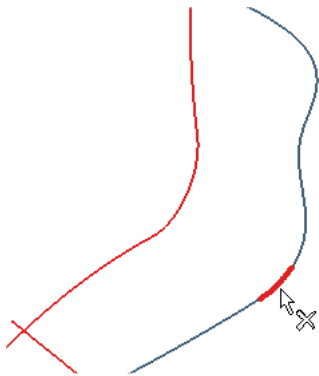
The excess portions of the curves are removed and now we will check the continuity of the curves.

- Go to **Tools** ⇨ **Info** ⇨ **Check Continuity**.
- Set type Curve-Curve.
- Click the curves in the proximity of the **.././Common end point**, as indicated.



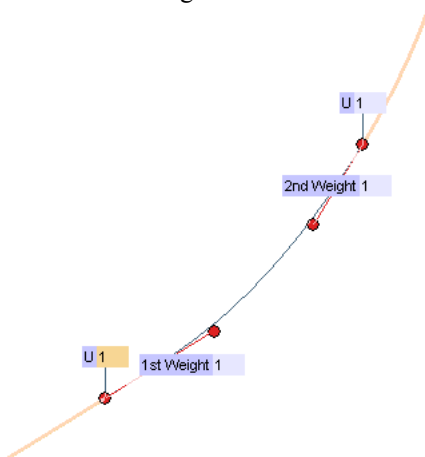
This dialog box shows that the selected curves are not tangent (3.728 deg).

- Delete the red curve since we are not going to use it.



We will use the **Connect Curve** command to fill the gap. Lets change the color of these curves for easy identification. Change them to red.

- Go to **Insert**  $\rightarrow$  **Curve**  $\rightarrow$  **Connect**
- Select the curves on the both sides of the **red** curve.
- Ensure the weights to be **1**.

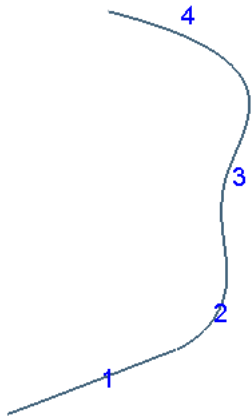


- Hit OK

We will use Check Continuity command to cross check the Tangency of these curves. The resultant should be Zero.

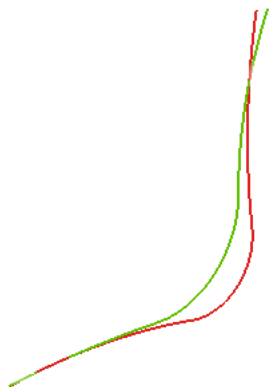
We need a single curve and so use Curve Join to join these 3D curves.

- Go to Modify->Curve->Join
- Select the four 3D curves.
- Check High parametric continuity.
- Hit OK.



- Start Convert the curve to NURBS.
- Select the last joined curve.
- Set Fix as Parameters.
- Set 200 in the "No. of points to fit".
- Degree 4 - Continuity 2 - Arc 8.
- Hit OK.

Hide the green curves and repeat two last commands on red curves.



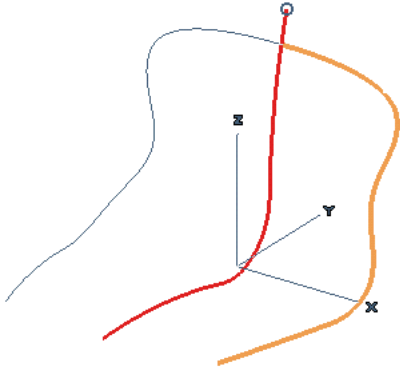
We also need a similar curve on the other side to complete the shape of the chair. So lets mirror this curve..

To achieve this, reorient the Work plane. Ensure that the work plane is displayed on the screen.

- Go to **Mirror Entities** command



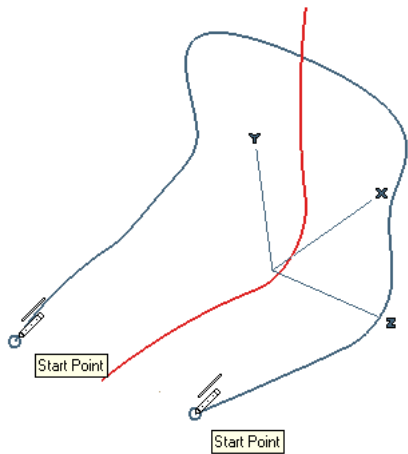
- Select the 3D limit back curve.
- Check Copy.
- Condition to "Perpendicular to axis & through point"; select in the list X axis.
- For point select Origin 0,0 snap.



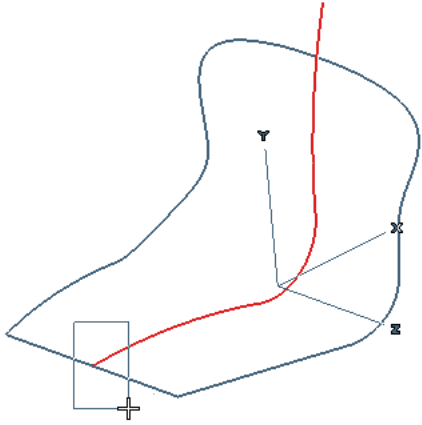
- Hit OK to complete the command and accept the mirrored curve.

Now draw a **Two-point Line** from the end point of the 3D mirrored curve.

- Start the **Two-point Line** command.
- Select end points on the basic and mirrored curves.
- Hit Esc.

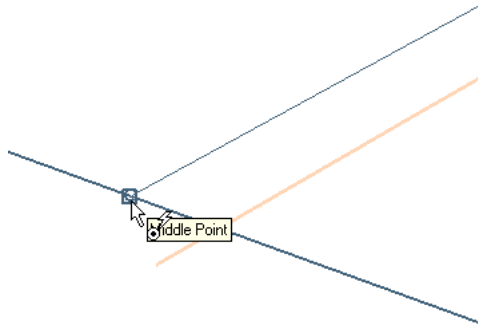


Zoom in to the indicated area.



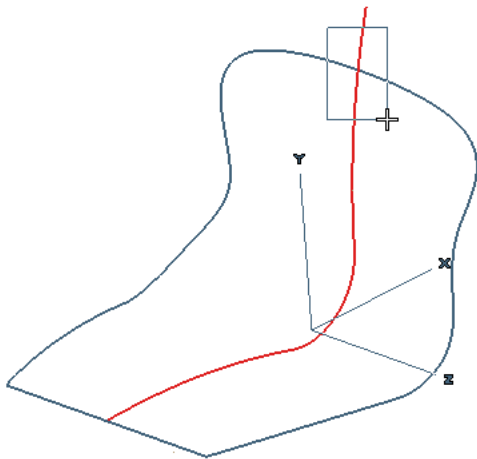
Zooming into the area you can find the G0 discontinuity between two curve. How do you correct it?

- Activate the **Curve Continuity** command.
- Set the Degree as Positional.
- Select red curve as Curve to modify.

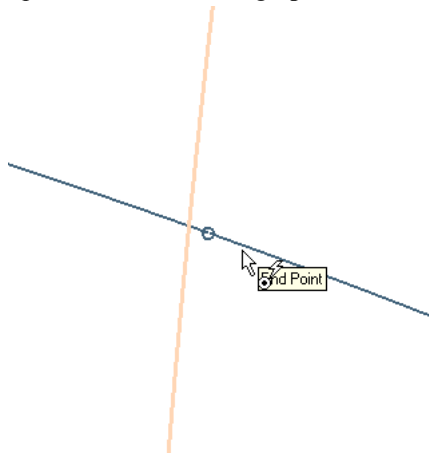


- and then select the previous line's **Mid Point Snap** as Reference point.
- Hit OK to complete the command.

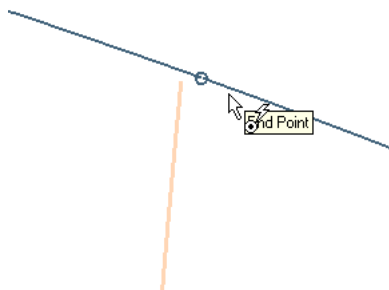
Zoom in to the other part.



Split the red curve using **Split Curve** with **End Point Snap** on one mirrored curve. Delete the upper segment.



Correct G0 discontinuity with **Curve Continuity**.



Good job. We have the basic 3d curve, derived from drawing views, ready to be completed with surface modeling.

