

Week 8 Topics and Assignment

Topics

- ☐ Using visual styles
- ☐ working with titled viewports
- ☐ navigating with the view cube
- ☐ orbiting in 3-D
- ☐ using cameras
- ☐ navigating with steering wheels
- ☐ saving views
- ☐ Creating surface models
- ☐ Editing surface models
- ☐ Creating solid models
- ☐ Editing solid model

Reading & Tutorials

AutoCAD 2012 (and LT)
Essentials
Chapter 16
Navigating 3D Models
Chapter 17
Modeling in 3D – Surface and Solid Models

Assignment & Support Files

- ☐ Your p1_3080_lastname drawing file (2D computer speaker)
OR
- ☐ P8_computer_speaker start.dwg
- ☐ P8 3080 Informational Drawing
- ☐ P8_3D_computer_speaker_SAMPLE DRAWING.pdf

Project 8 “Computer Speaker – 3D”

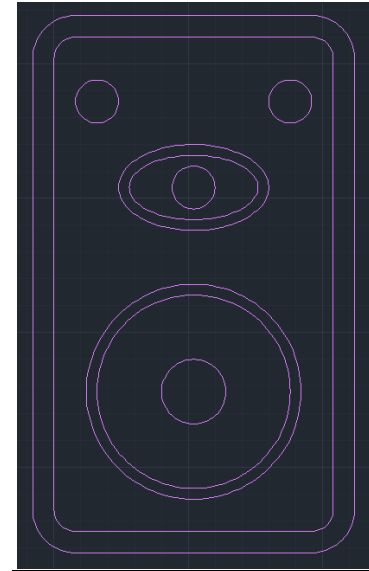
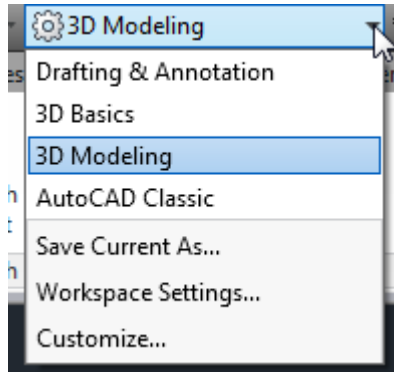
PROJECT OVERVIEW

In this assignment you will be creating the computer speaker we drew for the first project in 3D. You will start by loading your p1 drawing and modifying it to use an elliptical tweeter instead of a circular one. Then you will extrude, loft, fillet, and Boolean the 2d geometry of the speaker to create a 3D model of the speaker. Save your project because we will be adding materials and lighting to it in future projects.

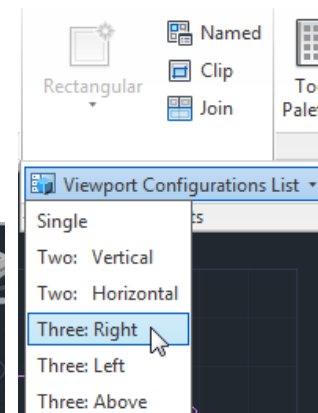
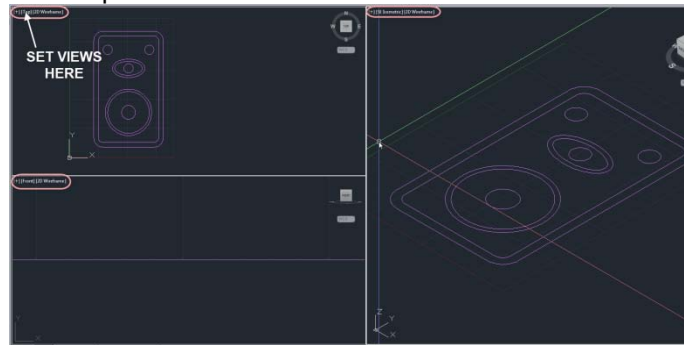
PROJECT INSTRUCTIONS

1. Open your **p1_3080_lastname.dwg** and immediately save it as a file called: **p8_3080_lastname** where *lastname* is your last name
2. Erase the circular tweeter speaker and draw the ellipse tweeter speaker in its place as shown on the **P8 3080 SAMPLE DRAWING**.
3. Replace the donuts used to show the speaker ports with circles of the same diameter.

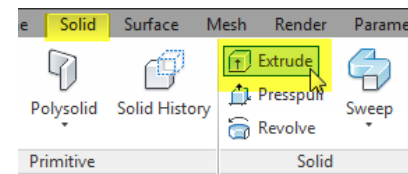
4. Create a new layer called **2D geometry** with a color of **201**. Put all the geometry in the drawing on the 2D geometry layer.
5. Change the workspace to 3D Modeling.



6. Click on the **View** tab and select **Three: right** from the **Viewport Configuration List** found on the **Viewports** panel.
7. Use the In-canvas controls to set the right viewport to **SE isometric**, the top left viewport to **Top** and the lower left viewport to **Front**.

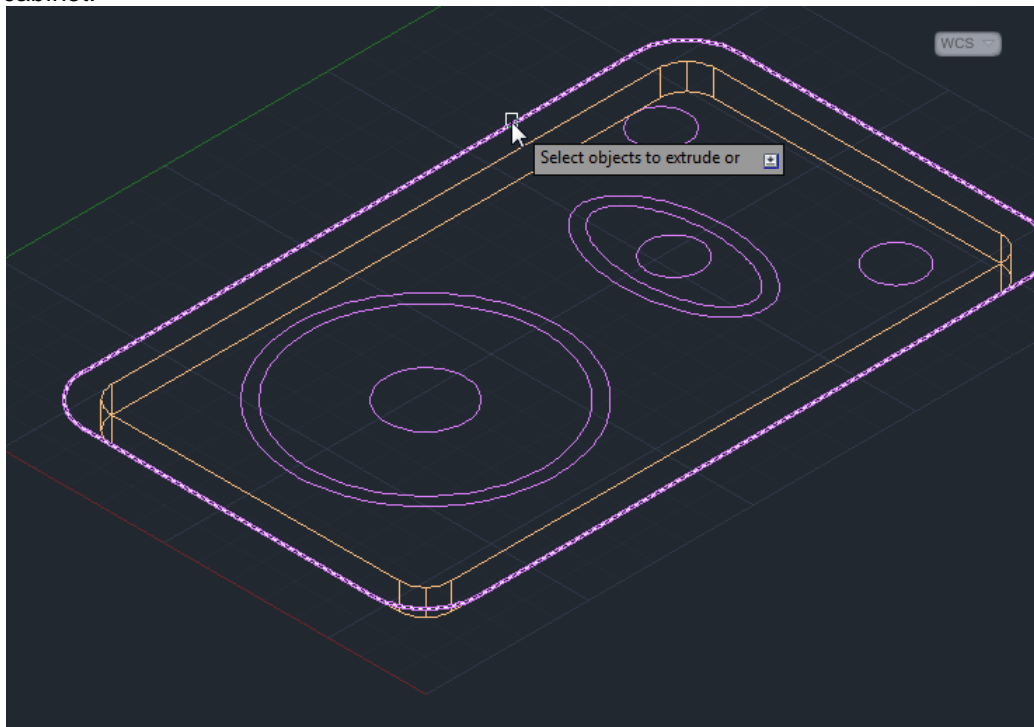


8. Set all the viewports to **2d Wire frame**
9. Create a new layer called **Speaker Cabinet** and give it color number **31**. Make it the current layer.
10. Click on the **Solid** tab and then pick on the **Extrude** icon found on the **Solid** Panel.
11. At the *Select Objects to Extrude or [Mode]:* prompt, click on the inner speaker cabinet line and hit **[enter]**

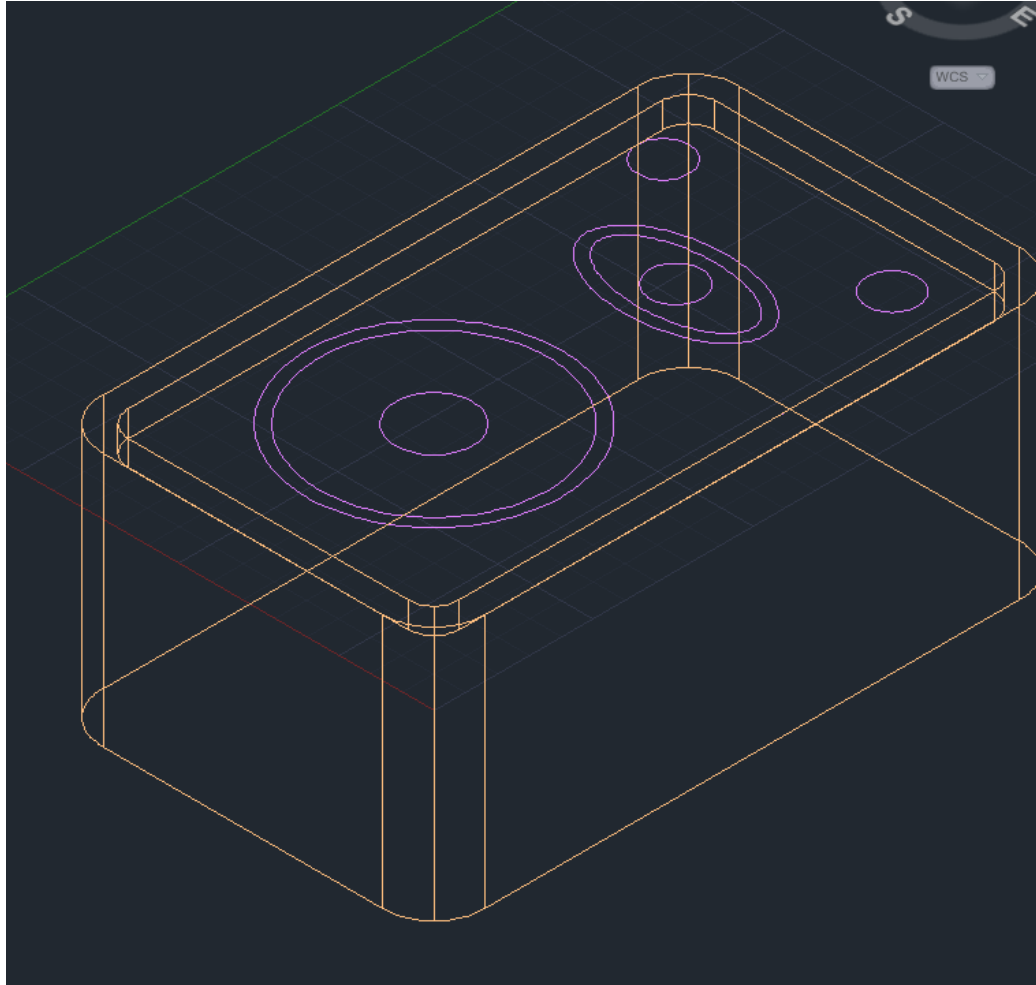




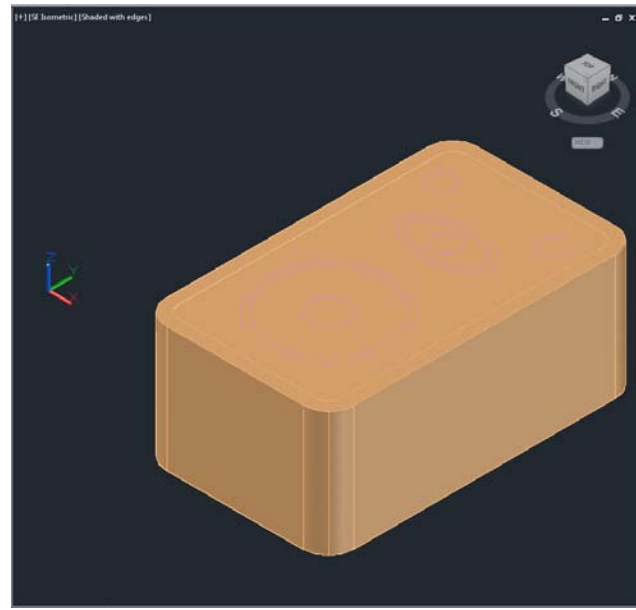
12. At the *Specify height of extrusion...* prompt, type **-.4 [enter]**
The idea here is to create a solid that is .4 inches deep that will be subtracted from the main body of the speaker later to create the recess in the speaker cabinet.
13. Repeat the extrude command, this time select the outer rectangle of the speaker cabinet.



14. At the *Specify height of extrusion...* prompt, type **-4 [enter]**.

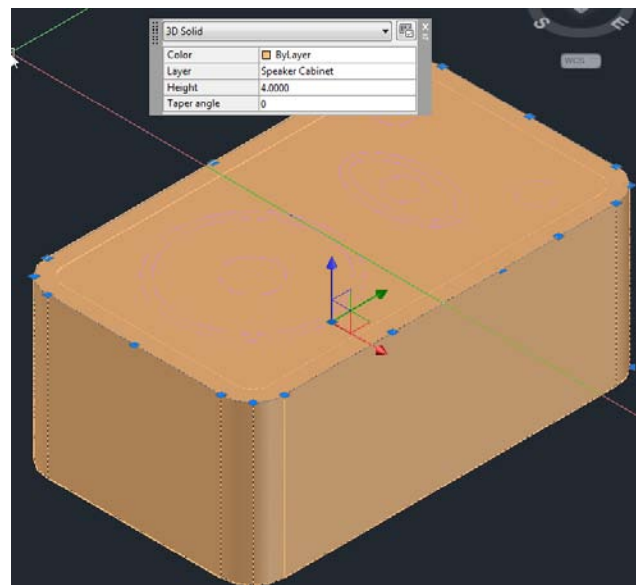


15. Set the **Visual Style** in the **SE Isometric** Viewport to **Shaded with edges** using the In canvas drop down menus.



16. Click on the **Solid** tab and select the **Subtract** icon found on the **Boolean** panel

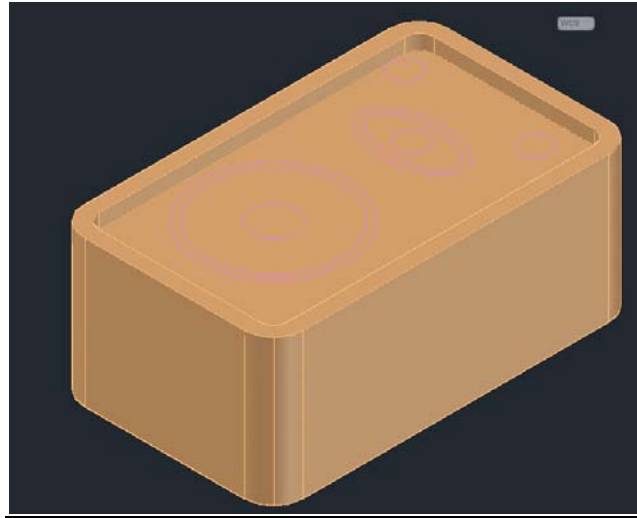
17. At the `_subtract` *Select solids, surfaces, and regions to subtract from ..* prompt, click on the outer solid object of the cabinet body and hit [enter]



18. At the *Select solids, surfaces, and regions to subtract ...* prompt, select the inner solid you created at .4 inches deep and hit [enter]

The second selected solid is subtracted from the first.

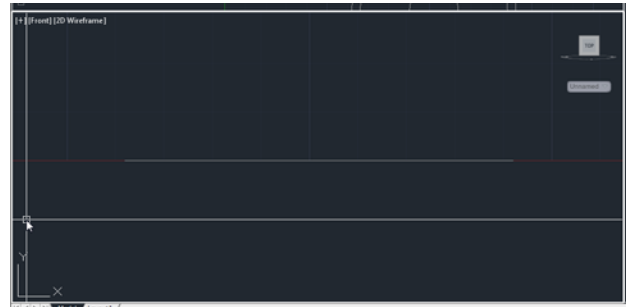
Now we need to create the tweeter and the speaker....



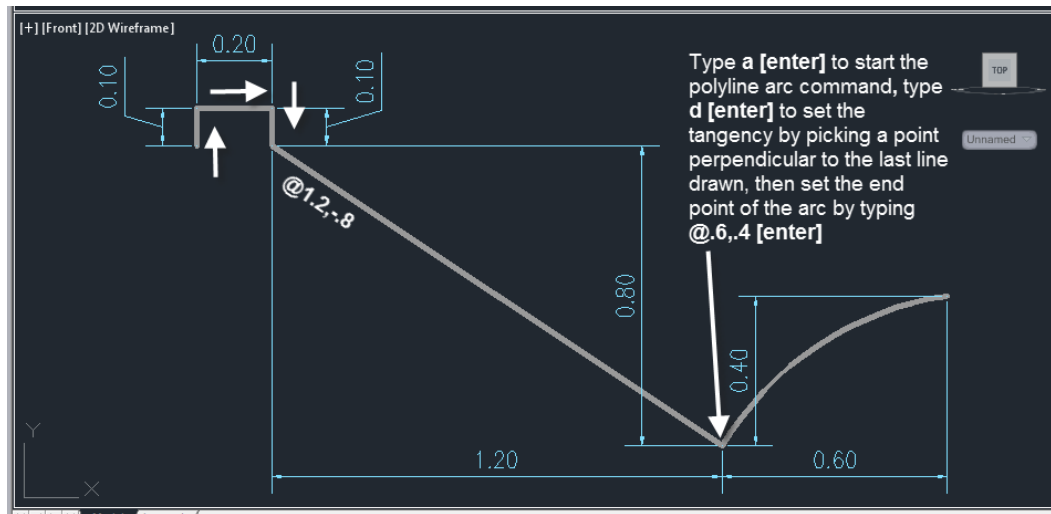
19. Set the current layer to **0** and freeze the **Speaker Cabinet** layer.
20. Create a new layer called **Woofer frame** with a color of **253** and make it current.
21. Select all the woofer geometry and move it to the **Woofer frame** layer. Make the **Woofer Frame** layer current.
22. Freeze the **2d Geometry** layer.

Now we want to create a cross section of the woofer so we can revolve it around a central axis to create a 3D model...

23. Click on the lower left viewport [**Front**] [**2D Wireframe**]. Zoom and pan to achieve a view like the one shown on the right



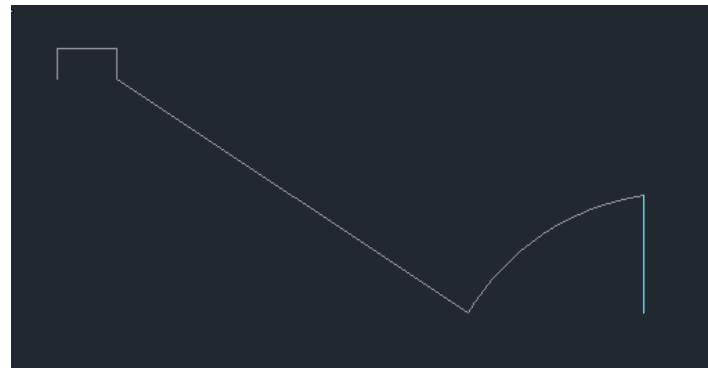
24. Turn Polar tracking on [**F10**] and type **pl [enter]** to start the polyline command.
25. Pick the first point to the lower left of the viewport and, using direct distance entry, draw a line **.1** unit long at **90 degrees**, then **.2** units long at **0 degrees** and **.1** unit long at **270 degrees**, turn polar tracking off [**F10**], then type **@1.2,-.8 [enter]** to draw the diagonal line. Continue at that point by typing **a [enter]** to create an arc, then type **d [enter]** and pick a point perpendicular to the diagonal line, then type **@.6,.4 [enter]** to complete the cross section of the woofer. See diagram below.



26. Create a new layer called **guide lines** with **141** color set to no plot and make it current.

27. Draw a perpendicular line at the end of the speaker cross section .4 units long as shown on the right.

28. Create two more layers: one called **Woofers cone** with the color **250**, and another called **Woofers dome** with the color **254**.



29. Type x [enter] to and pick the woofers cross section you just created to explode the polyline in to its component segments.

30. Make the SE Isometric viewport current and zoom as shown on the right.



31. Make sure the current layer is set to **Woofer frame**.

32. Click on the **Surface** tab and then on the Revolve icon in the **Create** panel

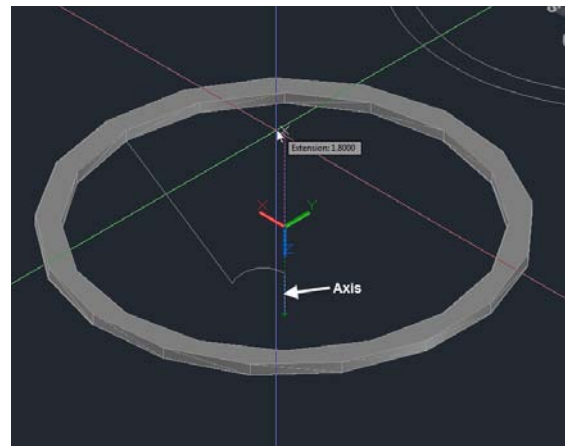


33. At the *Select objects to revolve:* prompt, select the three lines making up the frame of the woofer and hit **[enter]**

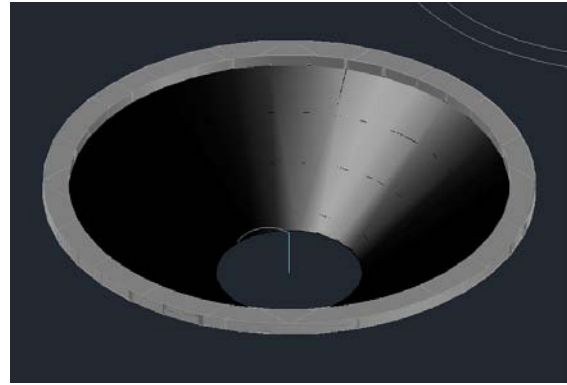
34. At the *Specify axis start point or define axis by [Object/x/y/z]:* prompt, type **o** **[enter]** and pick the vertical line you drew on the guide layer under the arc

35. At the *Specify angle of revolution or [Start angle/Reverse] <360>* prompt, type **[enter]** to take the default of 360.

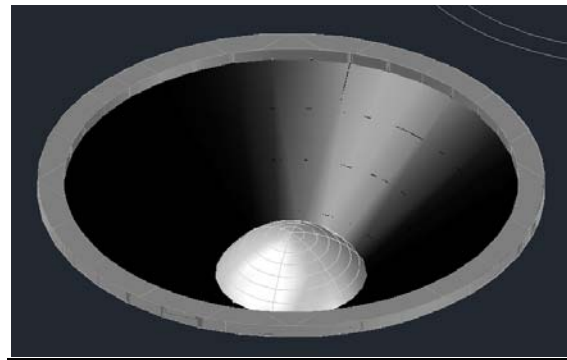
The Woofer frame is created on the Woofer frame layer.



36. Set the current layer to **Woofers cone** and repeat the above procedure revolving the single line of the Woofer cone.



37. Set the current layer to **Woofers dome** and repeat the above procedure revolving the arc of the Woofer dome.



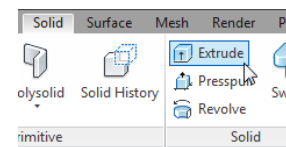
38. Thaw the **Speaker Cabinet** layer.

If you find that your 3D woofer is inside or overlapping the speaker cabinet, just move it out of the way for now.

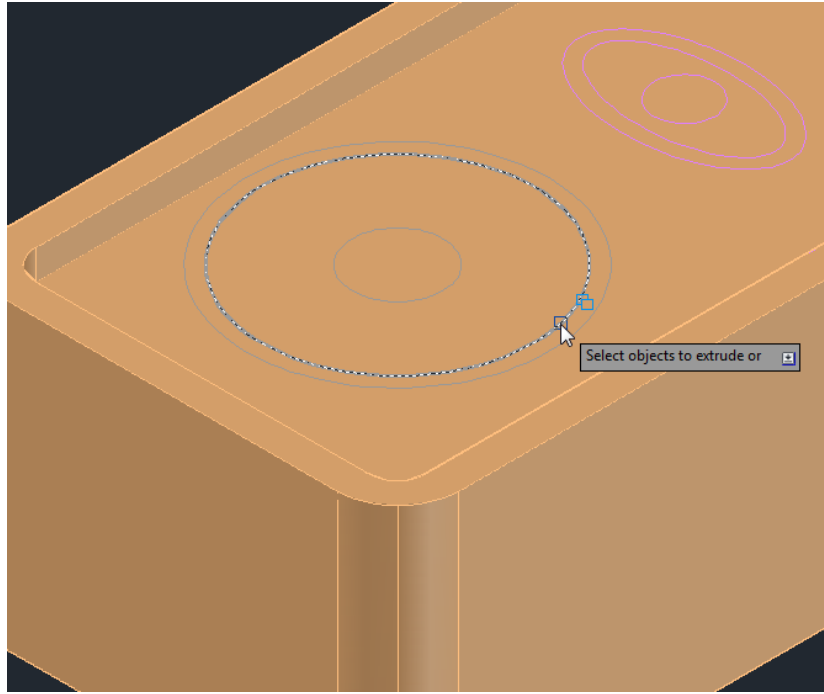
The speaker cabinet still has the 2d geometry positioned correctly over it and it can be used to cut holes front of the cabinet to accommodate the tweeter, woofer and ports.

39. Set the current layer to **Guidelines**

40. Click on the **Extrude** icon found on the **Solid panel** under the **Solid tab** (do not pick the Surface extrude icon)

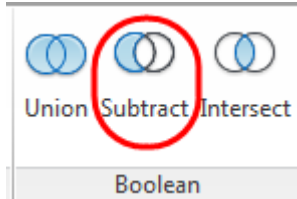


41. At the *select objects to extrude* prompt, click on the inner circle of the 2d woofer frame and hit **[enter]**

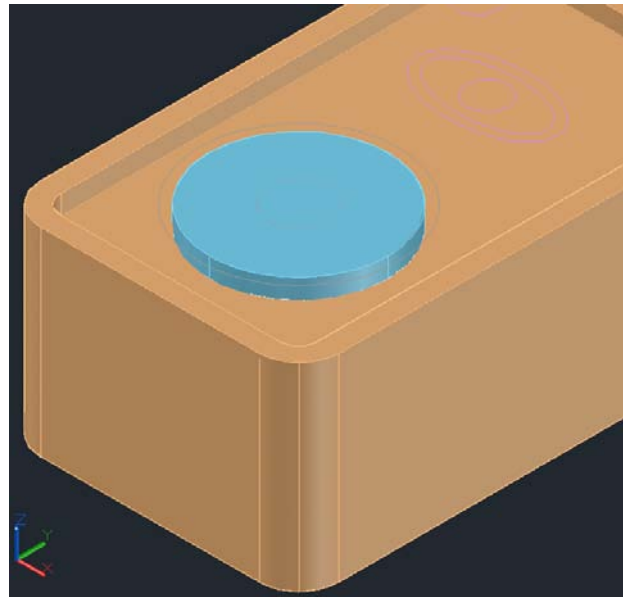


42. At the *Specify height of extrusion or [Direction/Path/Taper angle]:* prompt, type: **-3 [enter]**

43. Now select the Subtract icon



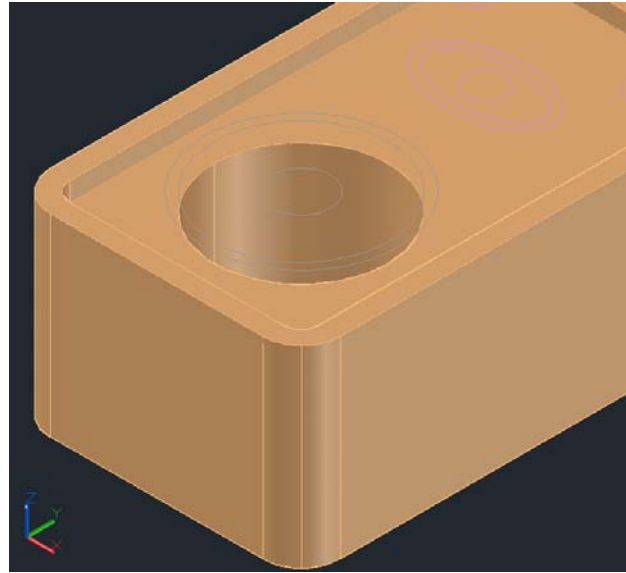
from the Boolean panel under the Solid tab



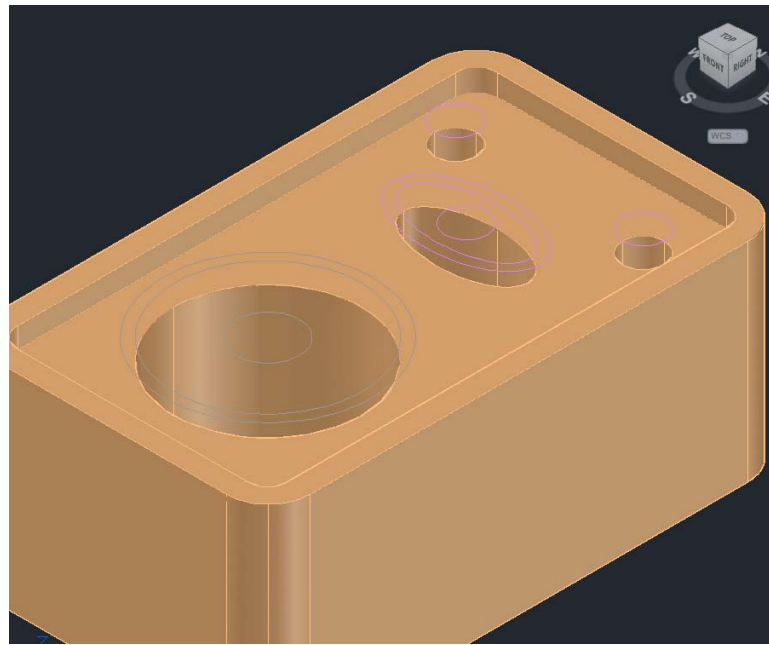
44. At the *_subtract Select solids, surfaces, and regions to subtract from ..* prompt, select the speaker cabinet and hit **[enter]**

45. At the *Select solids, surfaces, and regions to subtract ..* prompt, select the extruded circle you created in step 43 above.

A hole is created in the speaker cabinet.



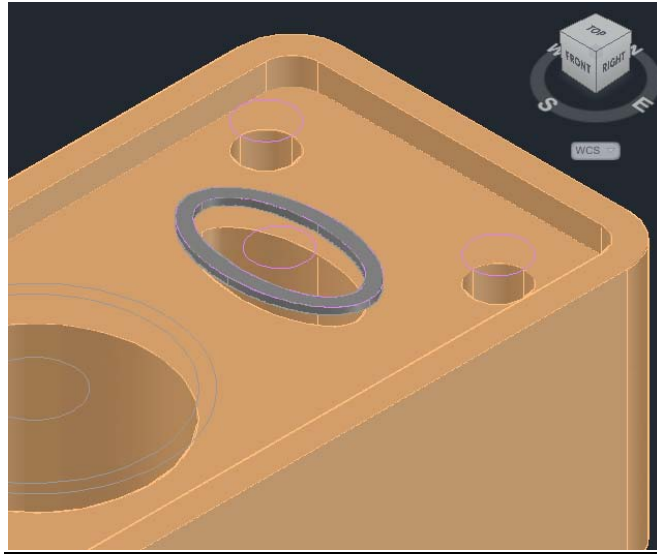
46. Perform Boolean subtraction as described above for the inner tweeter frame and the port holes.



To create the tweeter, the revolve method cannot be used because the tweeter isn't circular. Instead, here is what I suggest you do...

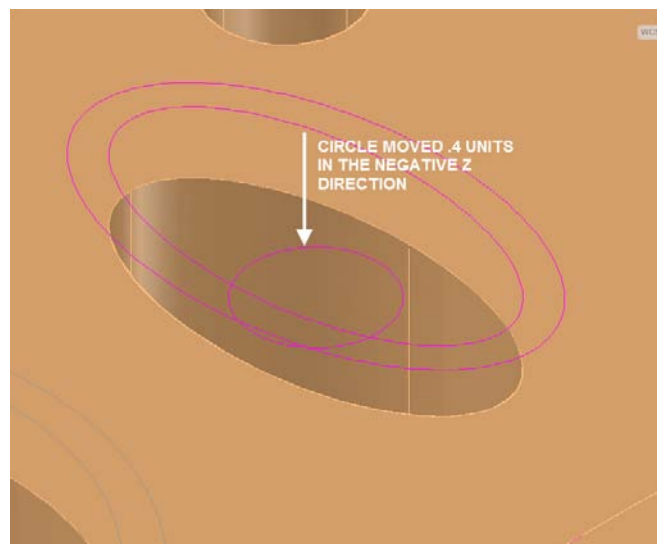
47. Create a new layer called **Tweeter frame** with the color 253.
48. The tweeter rim (frame) can be made by extruding both ellipses -.1 units, then subtract the inner one from the outer one.

To create the tweeter cone do the following:



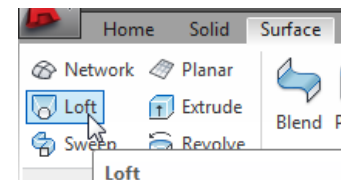
49. Freeze the **Tweeter Frame** layer leaving you with the 2D ellipses

50. Type **m [enter]** to initiate the move command. Click on the 2D dome circle and hit [enter]. Pick any point on the screen for the base point and then at the *Specify second point* prompt type **@0,0,-.4** (this moves the circle .4 units in the negative Z direction)



51. Create a new layer called **Tweeter Cone** with a color of 250 and make it current.

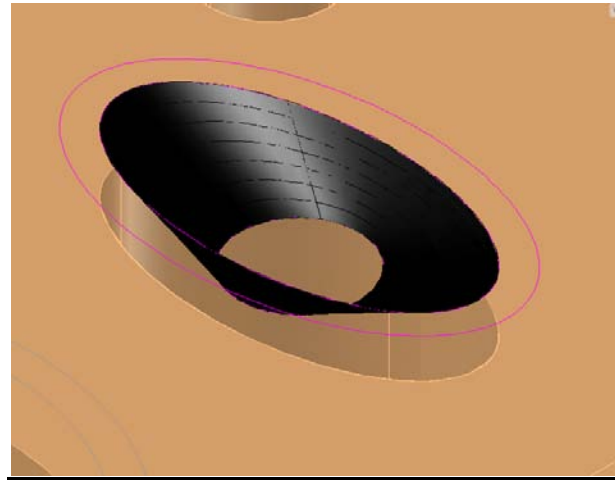
52. From the **Surface** tab, **Create** panel, select the **Loft** icon



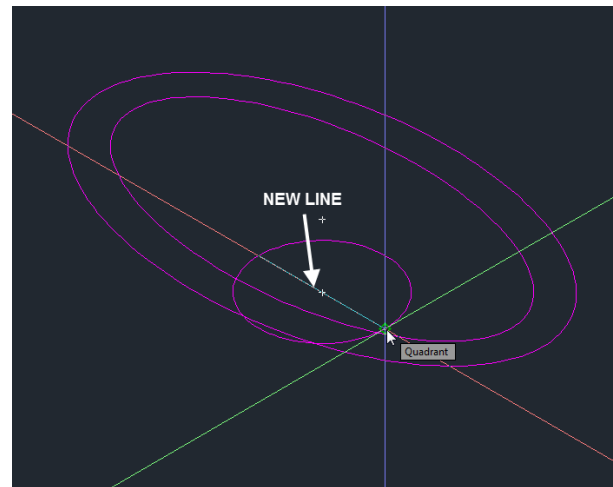
53. At the *Select cross sections in lofting order or [POint/Join multiple edges/MOde]*: prompt, select the ellipse then select the circle and press [enter]

54. Freeze the all the layers except 2D geometry

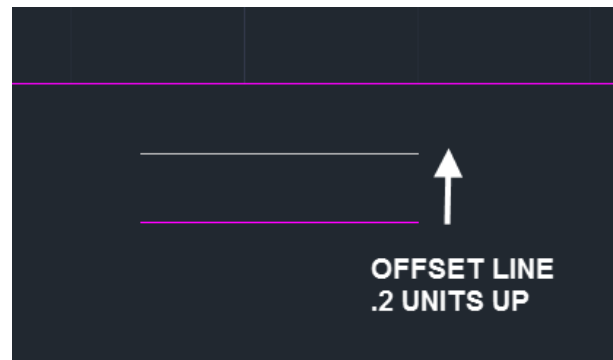
55. Create a new layer called **Tweeter Dome** with the color **254** and make it current



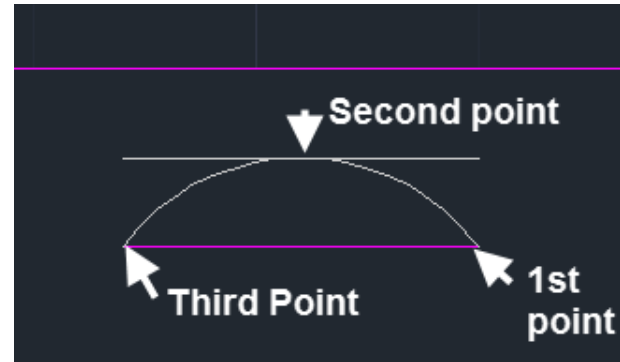
56. In SE Isometric viewport zoom in the 2D circle and draw a line across the middle of the circle from quad osnap to quad osnap



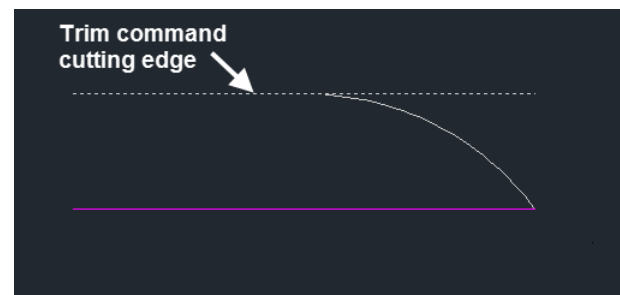
57. In the Front viewport, offset the line you just drew **.2** units toward the top.



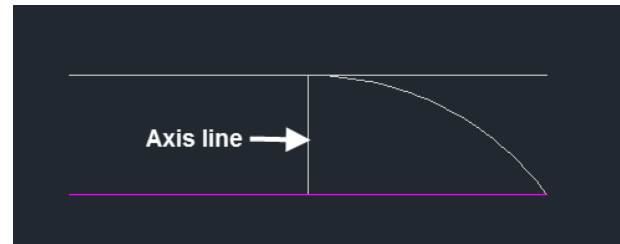
58. Draw a 3 point arc from the right endpoint of the lower line to the midpoint of the upper line to left end point of the lower line



59. Use the trim command to trim the arc back half way



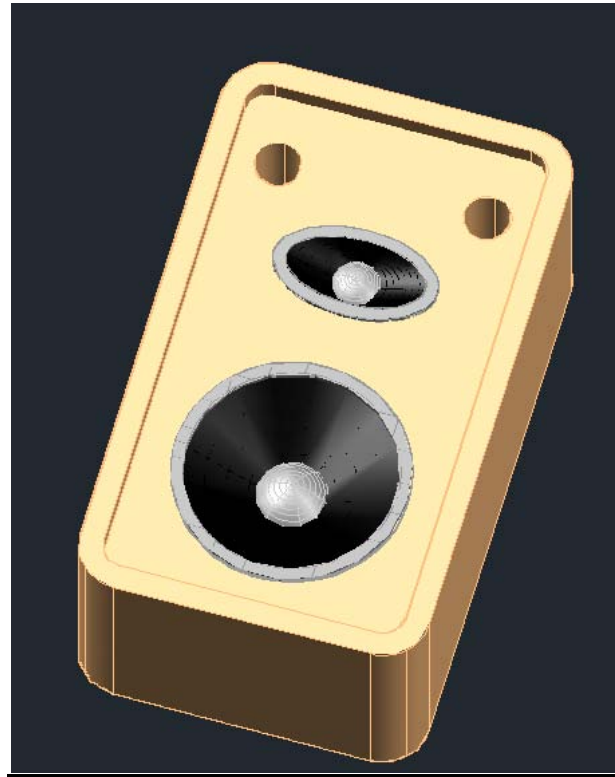
60. Draw an axis line as shown on the right



61. Use the revolve command as described above to create the Tweeter dome.

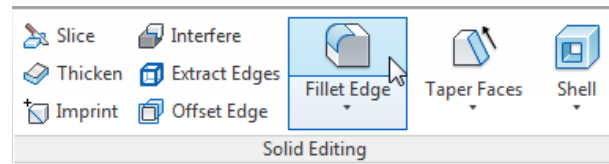


62. Use the move command to place the Woofer and Tweeter in their proper places on the cabinet.



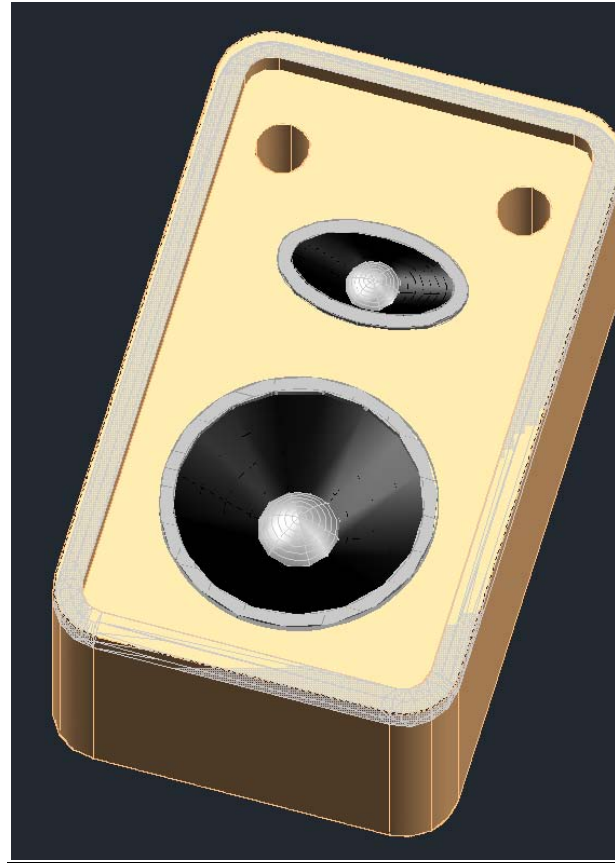
The last finishing touch is to fillet the edges of the cabinet using the Solid editing Fillet command....

63. Click on the **Fillet Edge** command found on the **Solid Editing** Panel under the **Solid** tab



64. At the *Select an edge or [Chain/Loop/Radius]:* prompt, type **r [enter]** and set the radius at **.4 units** and hit **[enter]**.

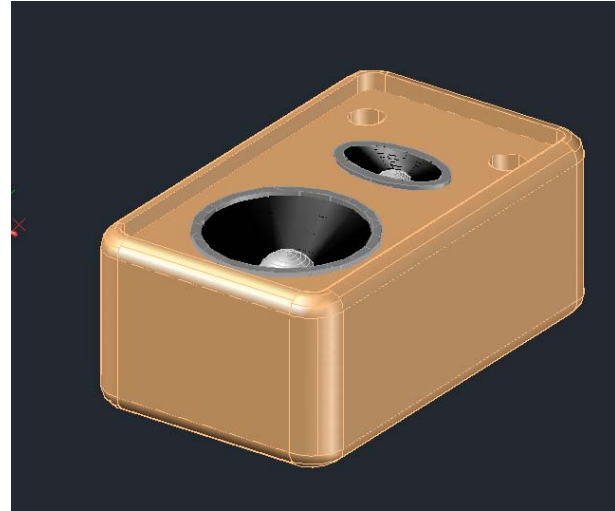
65. Back at the *Select an edge or [Chain/Loop/Radius]:prompt*, select all the outside edges around the top of the speaker.



66. Hit enter then enter again to accept the fillet



67. Repeat for the bottom edges.



Show your P8_3080_lastname.dwg file to the instructor or one of the course TA's to receive credit for completing the project.