

The background is a vibrant purple color. It features several abstract geometric shapes in a slightly darker shade of purple: a large circle in the upper left, a square on the left side, a triangle in the upper right, and several curved lines and segments scattered across the lower left and center. A large, white, semi-circular shape is positioned on the right side of the page, framing the text.

Roundabout & Intersection AutoCAD Tutorial

Suitable for Grade 12 students



In This Tutorial You Will Learn...

- How to draw a roundabout and intersection on AutoCAD
- You will be using the following commands:
 - PEDIT
 - DIMSTYLE
 - DIMLIN
 - DIMALI
 - DIMRAD
 - EXPLODE
 - OSNAP
 - LINE
 - CIRCLE
 - OFFSET
 - TRIM
 - ERASE
 - FILLET
 - LAYER

Thinking Like a Civil Engineer

- This tutorial will show you step-by-step how to draw a roundabout and intersection, something Civil Engineers often design, but there is an added challenge!
- Civil Engineers have to consider many things when they are designing transportation routes, such as the safety of pedestrians and cyclists
- Safety measures like crosswalks and bike lanes must be added to designs like the one we are drawing today

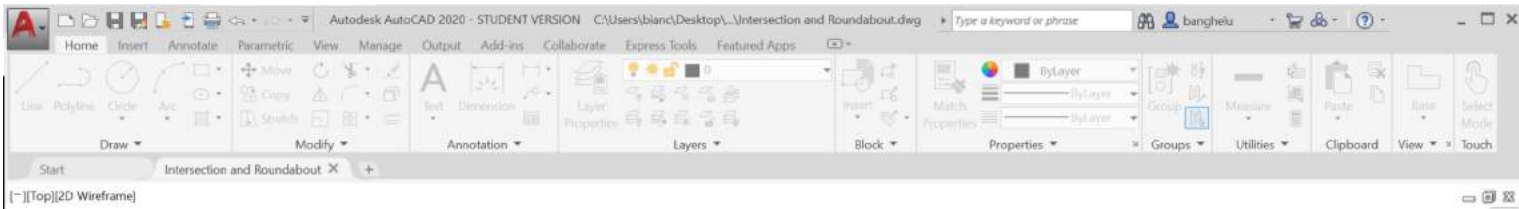


Goal For This Tutorial

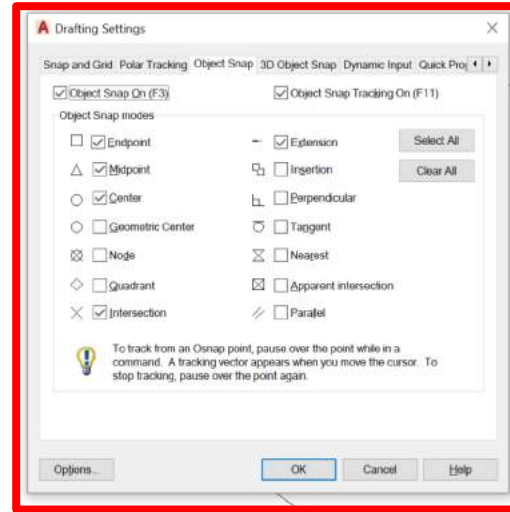
- Your goal for this design is to design crosswalks and bike lanes for the roundabout and intersection
- Consider the dimensions of the design and where it would make most sense to include these features, think like a Civil Engineer!
- Check out the “AutoCAD Commands Cheat-Sheet” for command explanations and specific syntax

Remember to save your drawing at the beginning of the tutorial using the SAVEAS command

Save your drawing periodically throughout this tutorial using the SAVE command

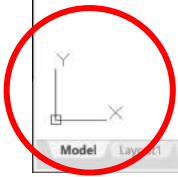


[Top]2D Wireframe



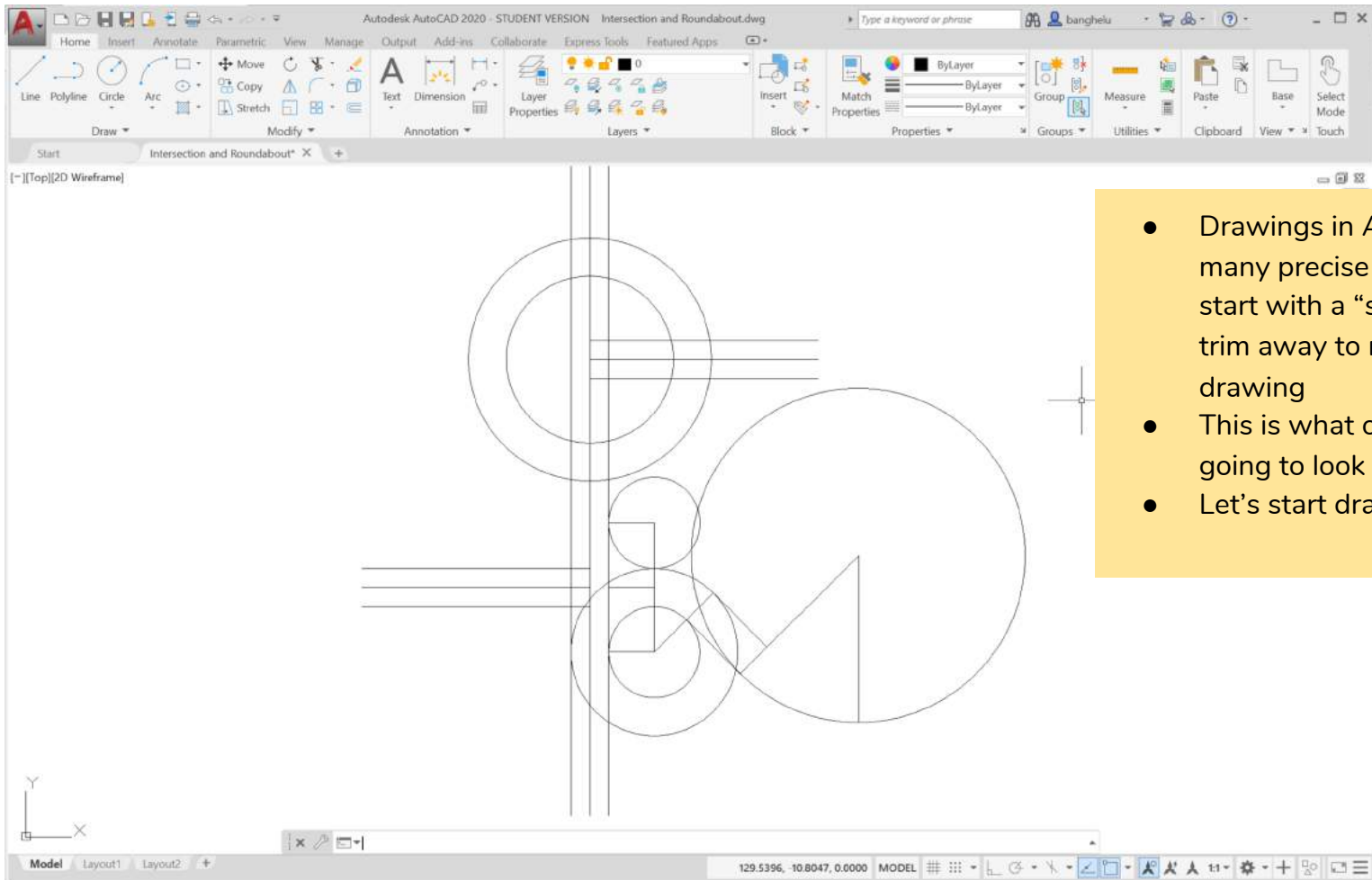
- Before you start drawing, make sure your Drafting Settings look like this
- Type "OSNAP" into the command bar and press enter
- Select your settings and click "OK"

- We do not want our XY axis (UCS icon) to be in the way while we draw, so we will set it to **non origin**
- Type "USCICON" into the command bar and press enter
- Type "n" for non origin and press enter

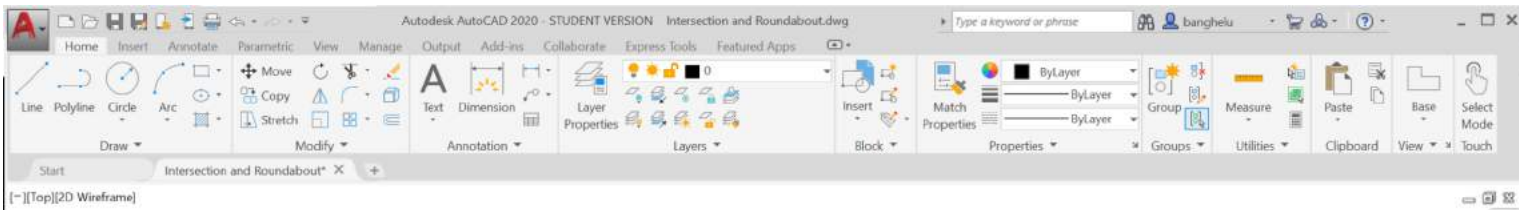


Type a command

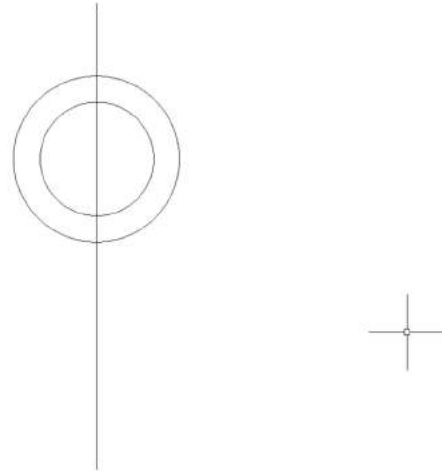
-13.9217, 30.7049, 0.0000 MODEL



- Drawings in AutoCAD that have many precise measurements start with a “skeleton” that we trim away to reveal the true drawing
- This is what our “skeleton” is going to look like
- Let’s start drawing!

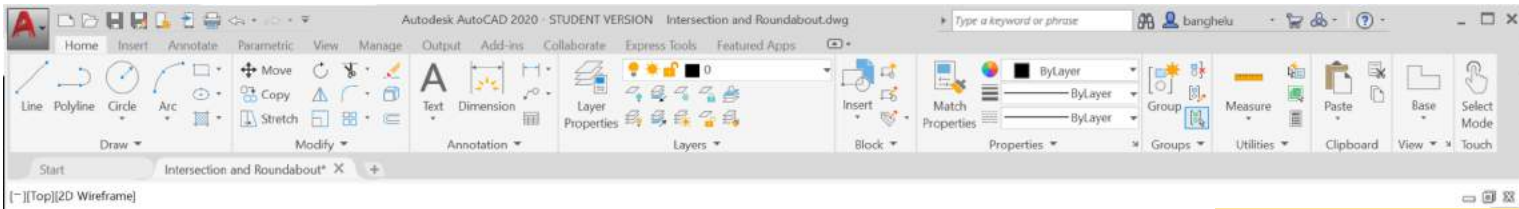


[--][Top][2D Wireframe]

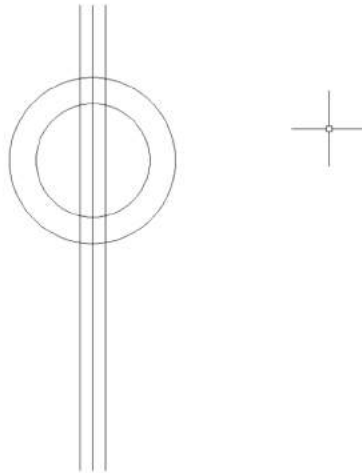


- Draw a circle with its centre at (0,0) and radius of 22 units
- Draw a circle with its centre at (0,0) and radius of 32 units
- These circles will make the roundabout
- Draw a line from the centre of the circle 120 units downwards:
LINE -> (0,0) -> @120<-90
- Draw a line from the centre of the circle 60 units upwards:
LINE -> (0,0) -> @60<90





[Top]2D Wireframe



- Offset both lines 5 units to the left and right
- OFFSET -> 5 -> select lines
- This will become a road



Model Layout1 Layout2 +

91.4190, 12.2477, 0.0000

MODEL

Grid

Ortho

OSNAP

SNAP

SNAPMODE

SNAPGRID

SNAPRECT

SNAPCIRCLE

SNAPANGLE

SNAPDIST

SNAPTANGENT

SNAPQUADRANT

SNAPMIDPOINT

SNAPENDPOINT

SNAPCENTER

SNAPPERPENDICULAR

SNAPFACE

SNAPEDGE

SNAPVERTEX

SNAPFACE

SNAPEDGE

SNAPVERTEX

SNAPFACE

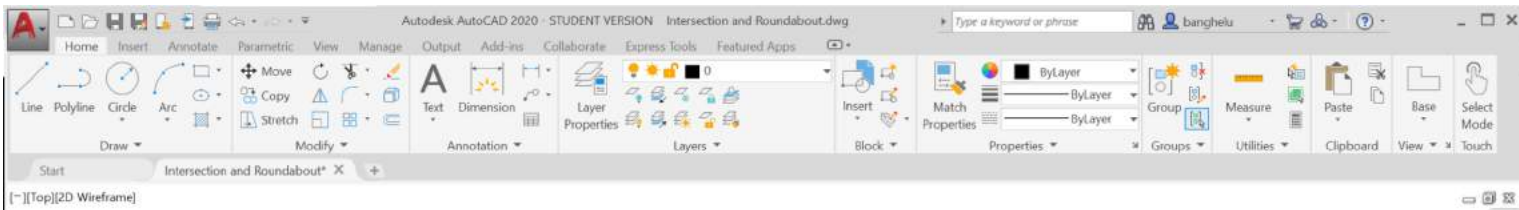
SNAPEDGE

SNAPVERTEX

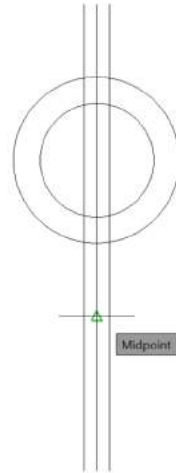
SNAPFACE

SNAPEDGE

SNAPVERTEX

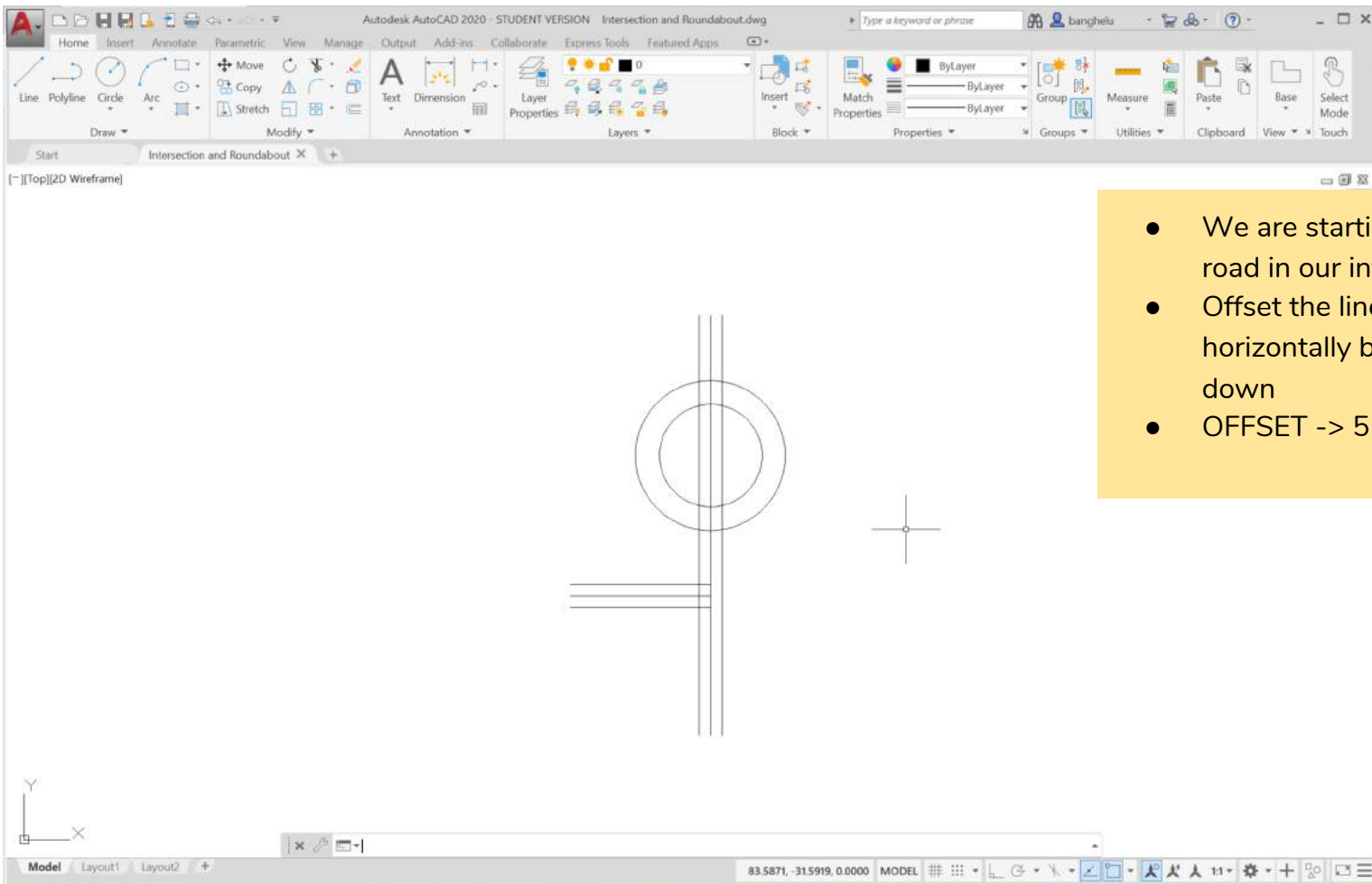


[~][Top][2D Wireframe]

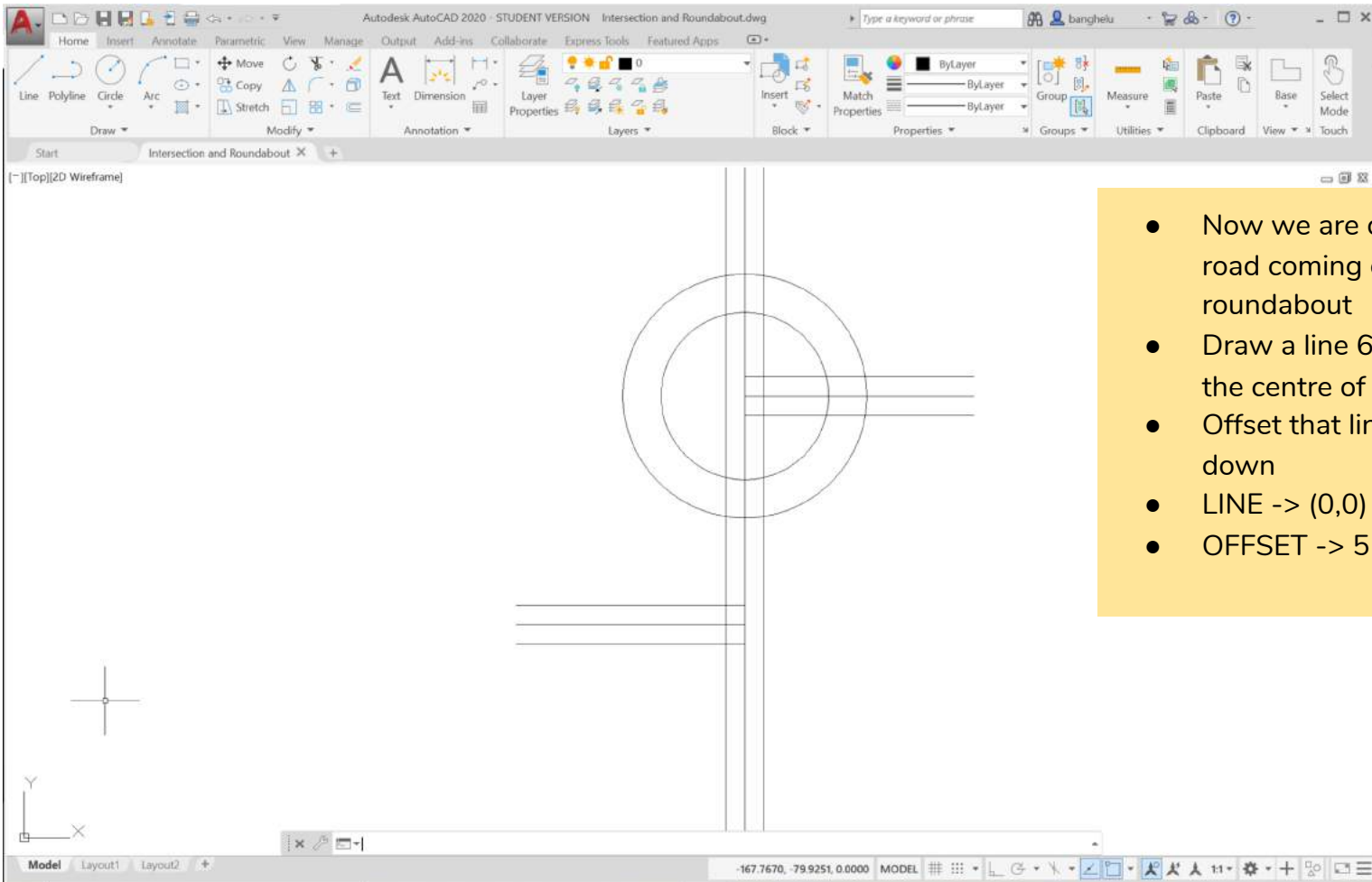


- Draw a line of 60 units to the left, the line will start at the midpoint of the line we drew previously (0,-60)
- LINE -> Grip Midpoint -> @60<180
- This will become a road in the intersection and leading to the roundabout

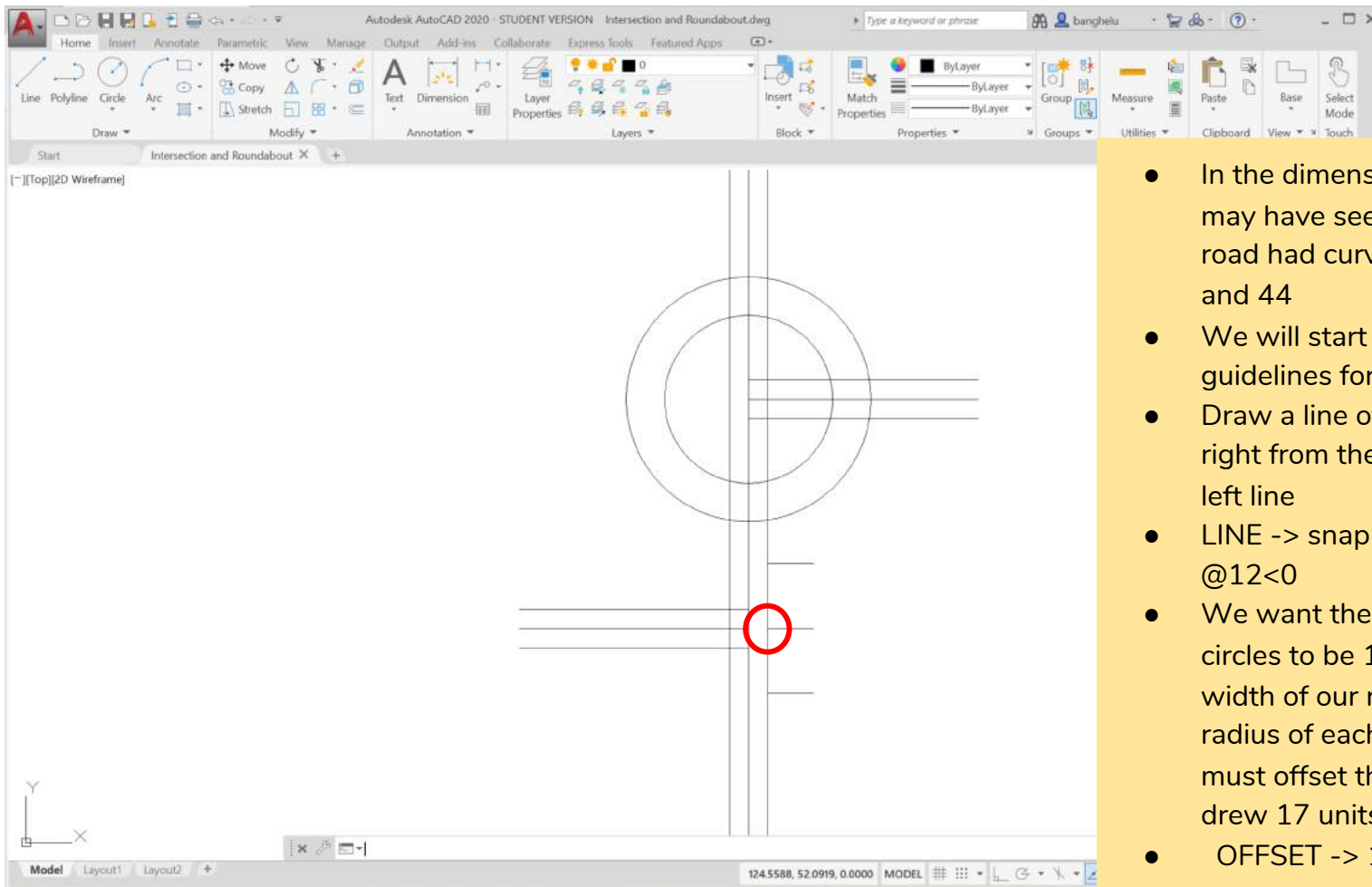




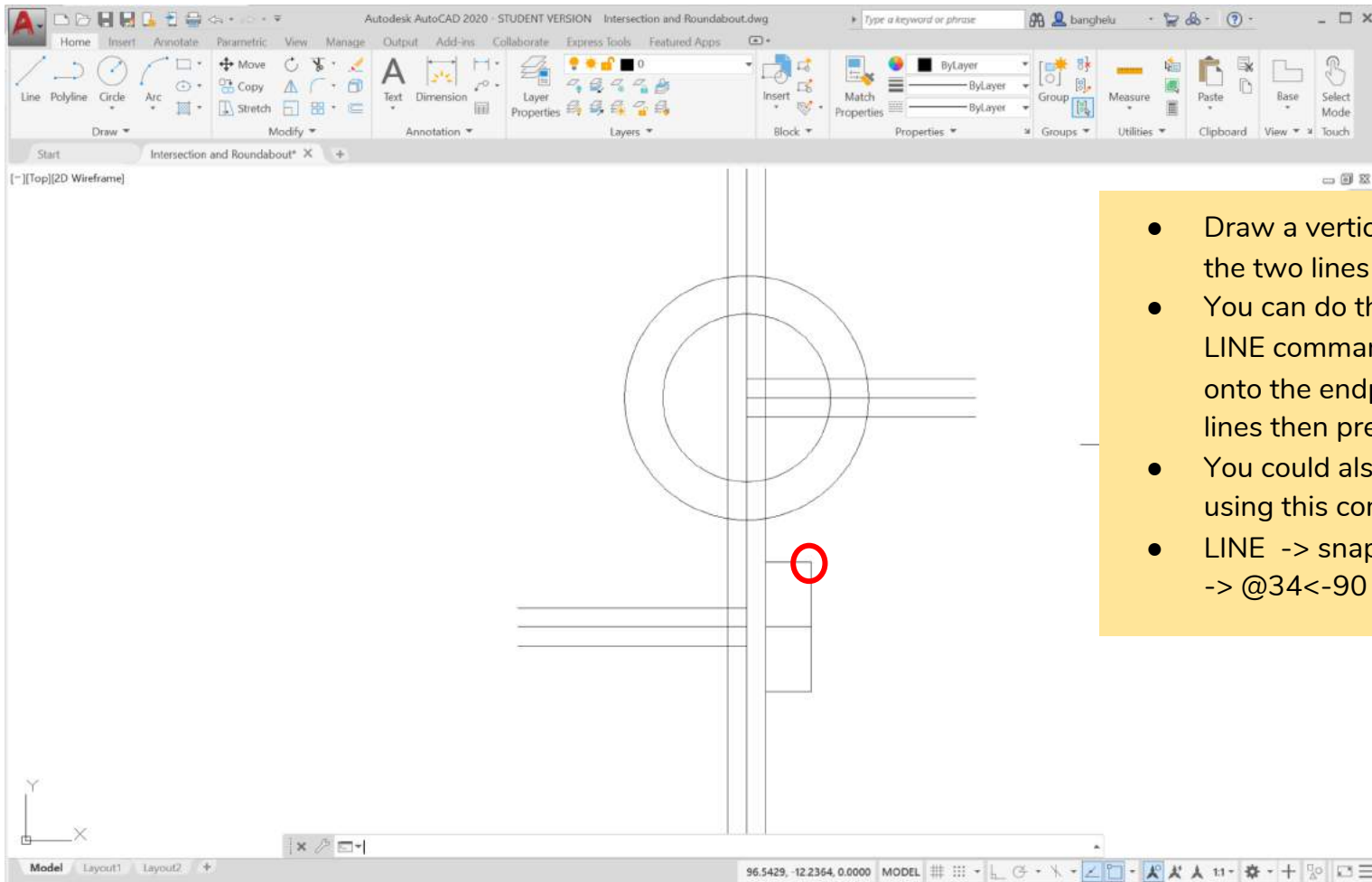
- We are starting to draw the first road in our intersection
- Offset the line you drew horizontally by 5 units up and down
- OFFSET -> 5 -> select line



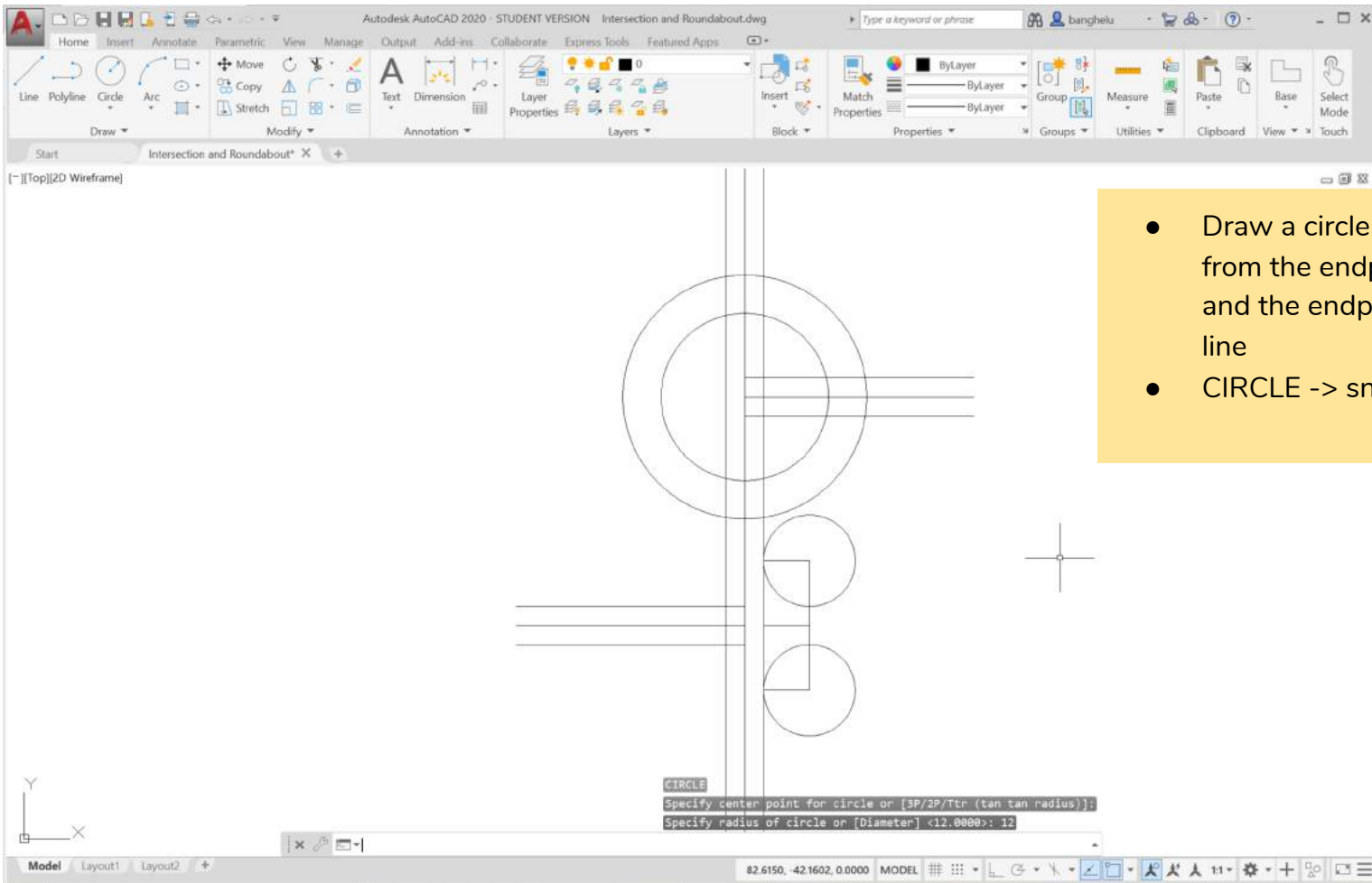
- Now we are drawing a second road coming off of the roundabout
- Draw a line 60 units right from the centre of the circles
- Offset that line 5 units up and down
- LINE -> (0,0) -> @60<0
- OFFSET -> 5 -> select lines



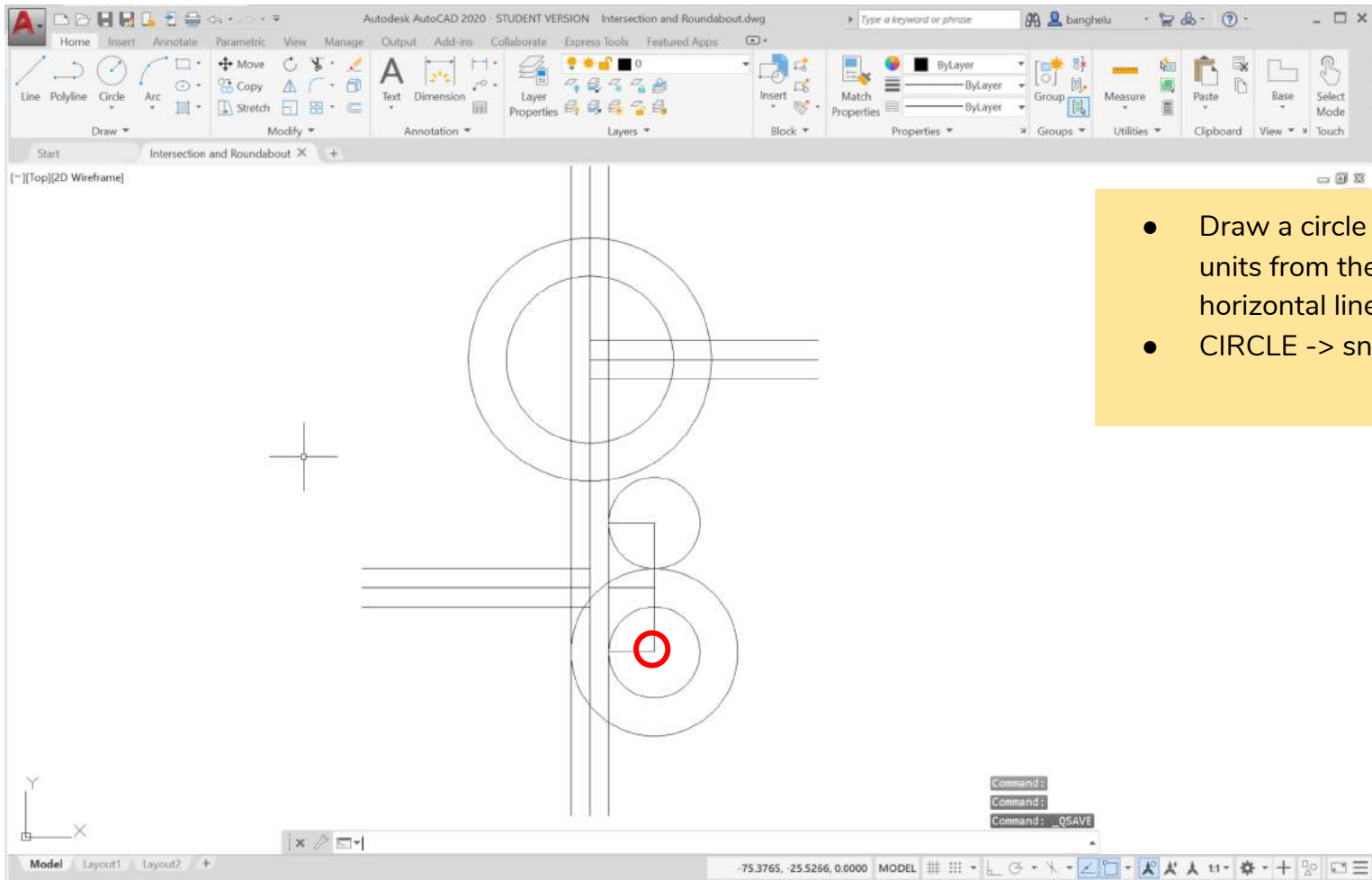
- In the dimensioned drawing you may have seen that the right road had curves of radii 12, 22, and 44
- We will start by drawing the guidelines for the radii of 12
- Draw a line of 12 units to the right from the midpoint of the left line
- LINE -> snap midpoint -> @12<0
- We want the two curves of the circles to be 10 units apart (the width of our road), and the radius of each circle is 12, so we must offset the line we just drew 17 units up and down
- OFFSET -> 17 -> select lines



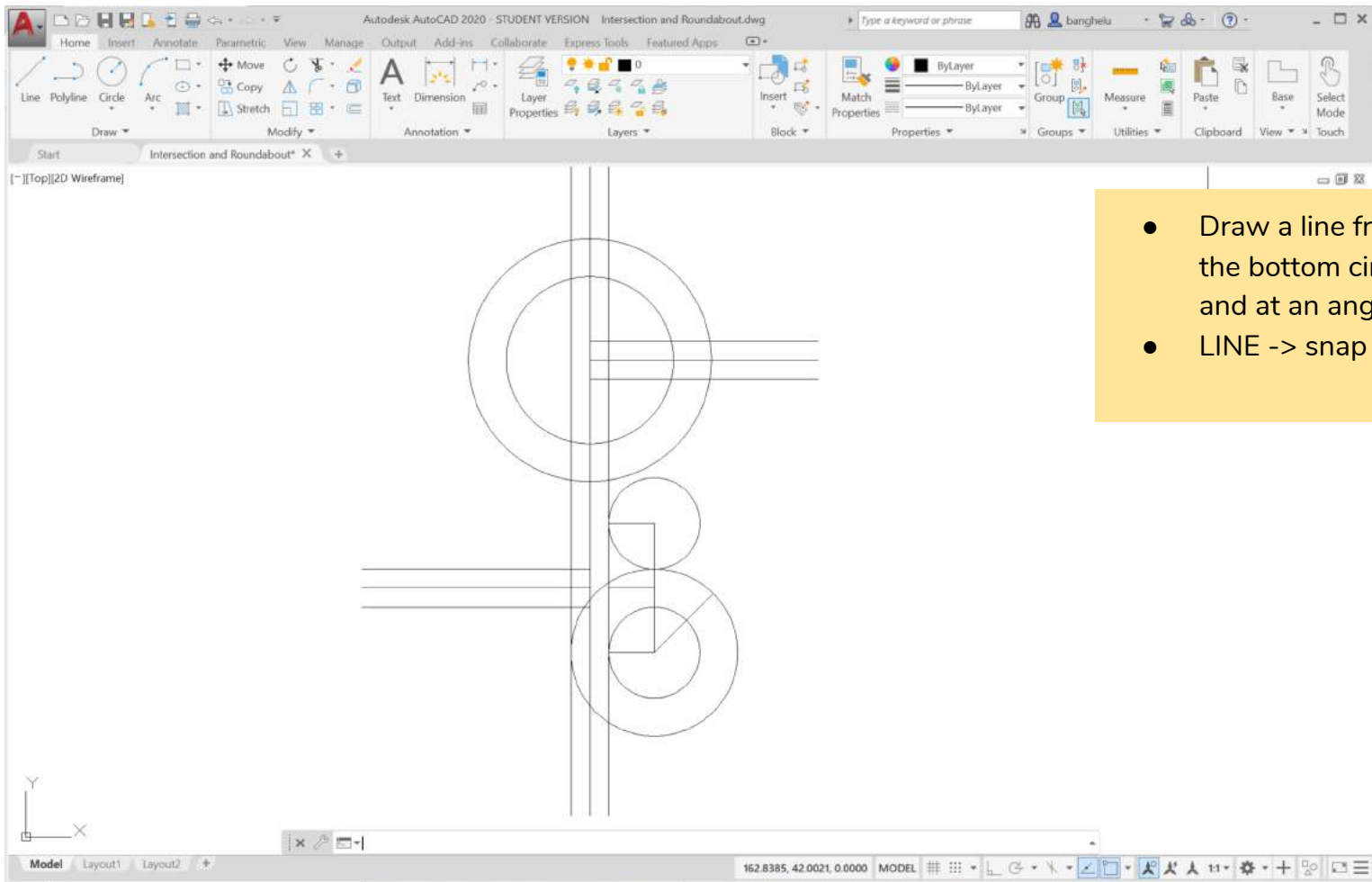
- Draw a vertical line connecting the two lines we just offset
- You can do this by typing in the LINE command and snapping onto the endpoint of all three lines then pressing enter
- You could also draw this line using this command:
- LINE -> snap endpoint top line -> @34<-90



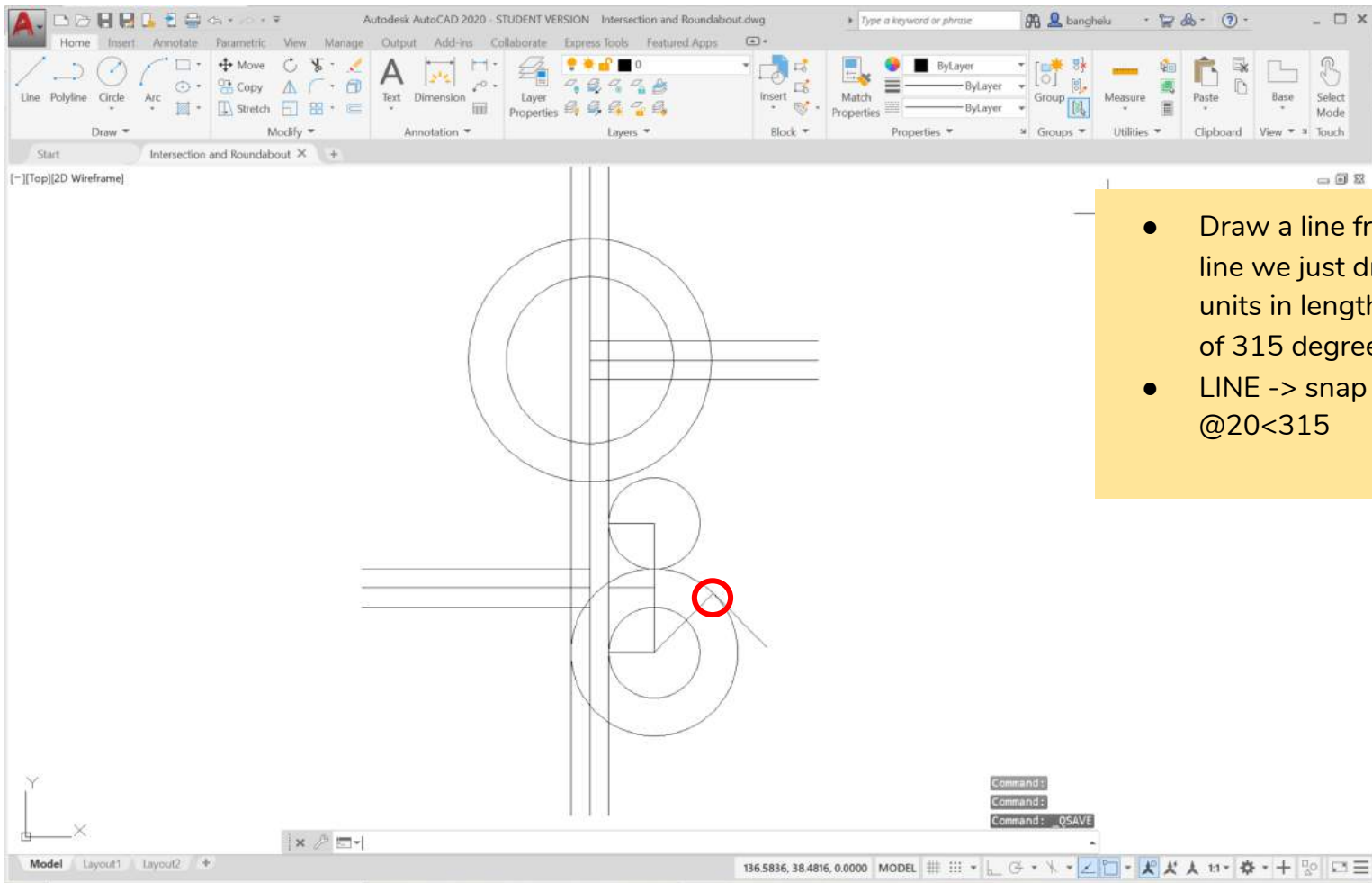
- Draw a circle of radius 12 units from the endpoint of the top line and the endpoint of the bottom line
- CIRCLE -> snap endpoint -> 12



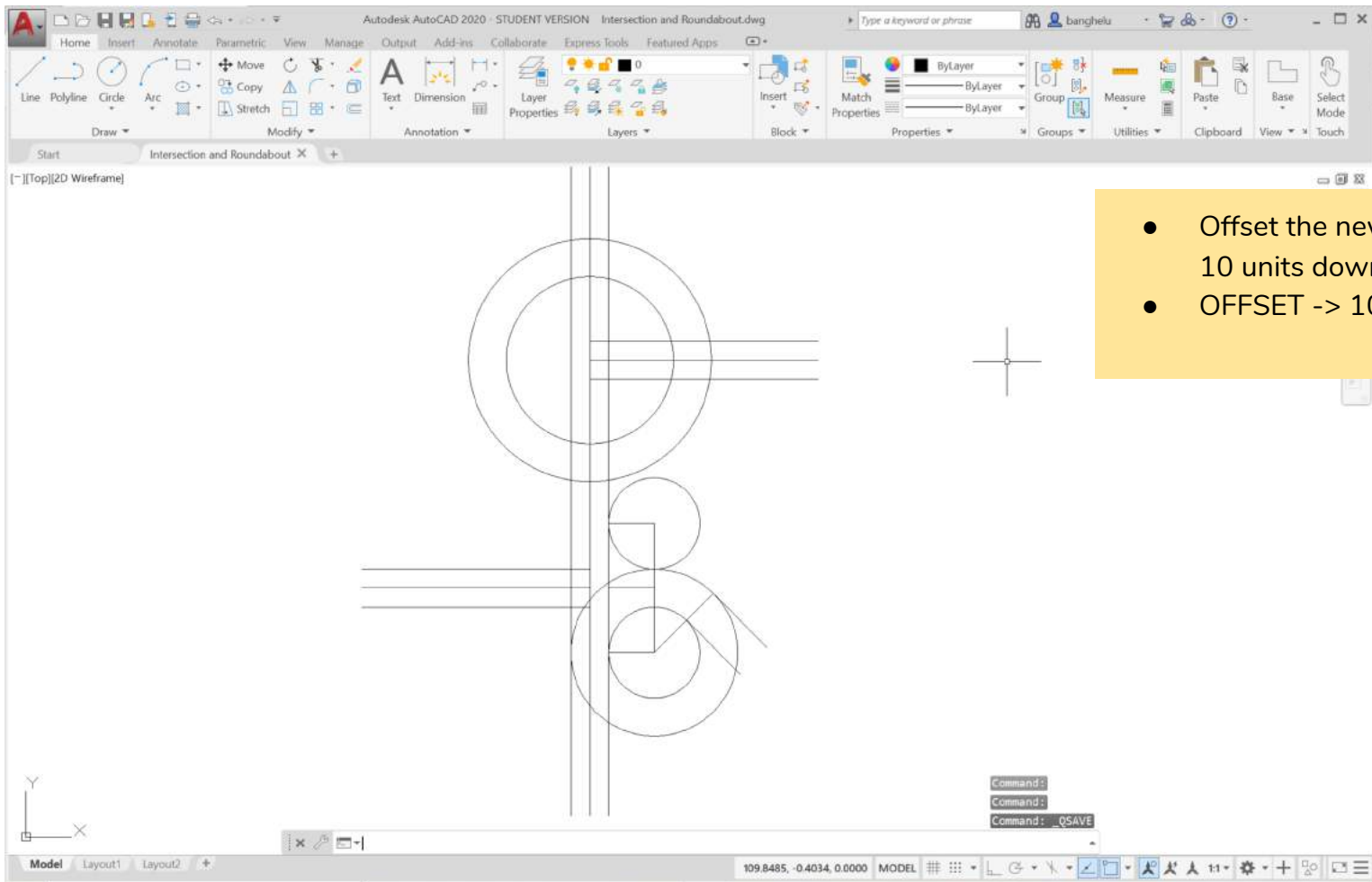
- Draw a circle of a radius 22 units from the endpoint of the horizontal line
- CIRCLE -> snap endpoint -> 22



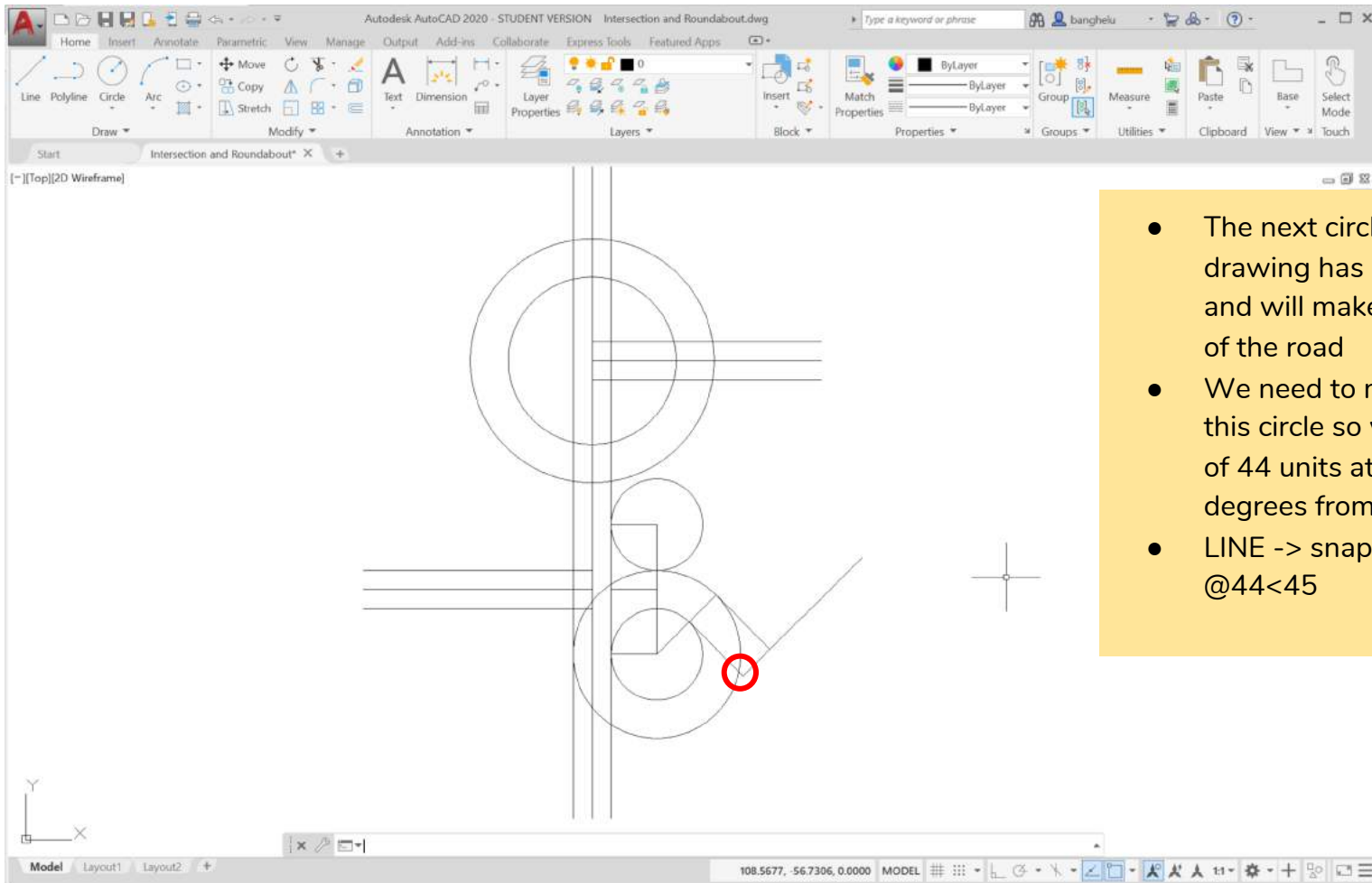
- Draw a line from the centre of the bottom circle that is 22 units and at an angle of 45 degrees
- LINE -> snap centre -> @22<45



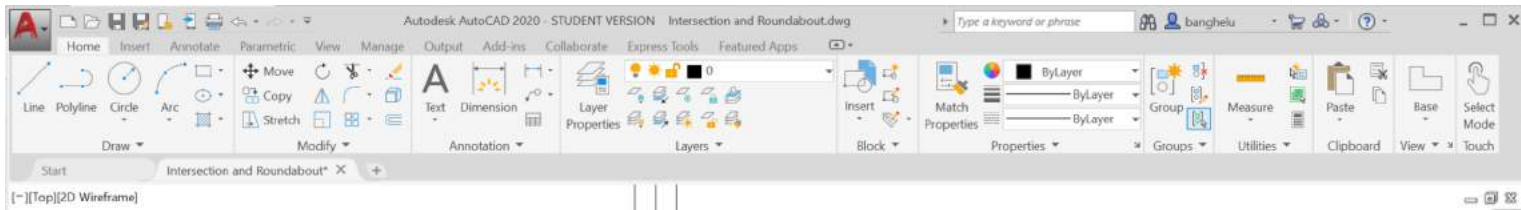
- Draw a line from the end of the line we just drew that is 20 units in length and at an angle of 315 degrees
- LINE -> snap endpoint -> @20<315



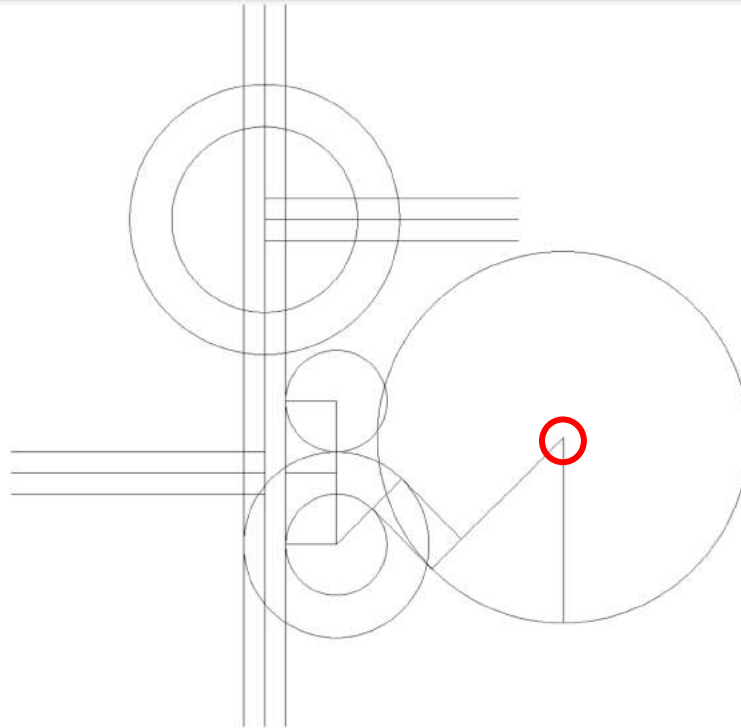
- Offset the new line a distance of 10 units downwards
- OFFSET -> 10 -> select line



- The next circle we will be drawing has a radius of 44 units and will make the bottom curve of the road
- We need to make a guideline for this circle so we will draw a line of 44 units at an angle of 45 degrees from the specified point
- LINE -> snap endpoint -> @44<45



[~][Top][2D Wireframe]



- From the end of the line we previously drew, draw a circle with a radius of 44 units and a line of 44 units downwards
- CIRCLE -> snap endpoint ->44
- LINE -> snap endpoint -> @44<-90
- Our “skeleton” is now complete!
- We can start erasing and trimming lines to reveal the true drawing



Model Layout1 Layout2

129.5396, -10.8047, 0.0000

MODEL

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

MODE

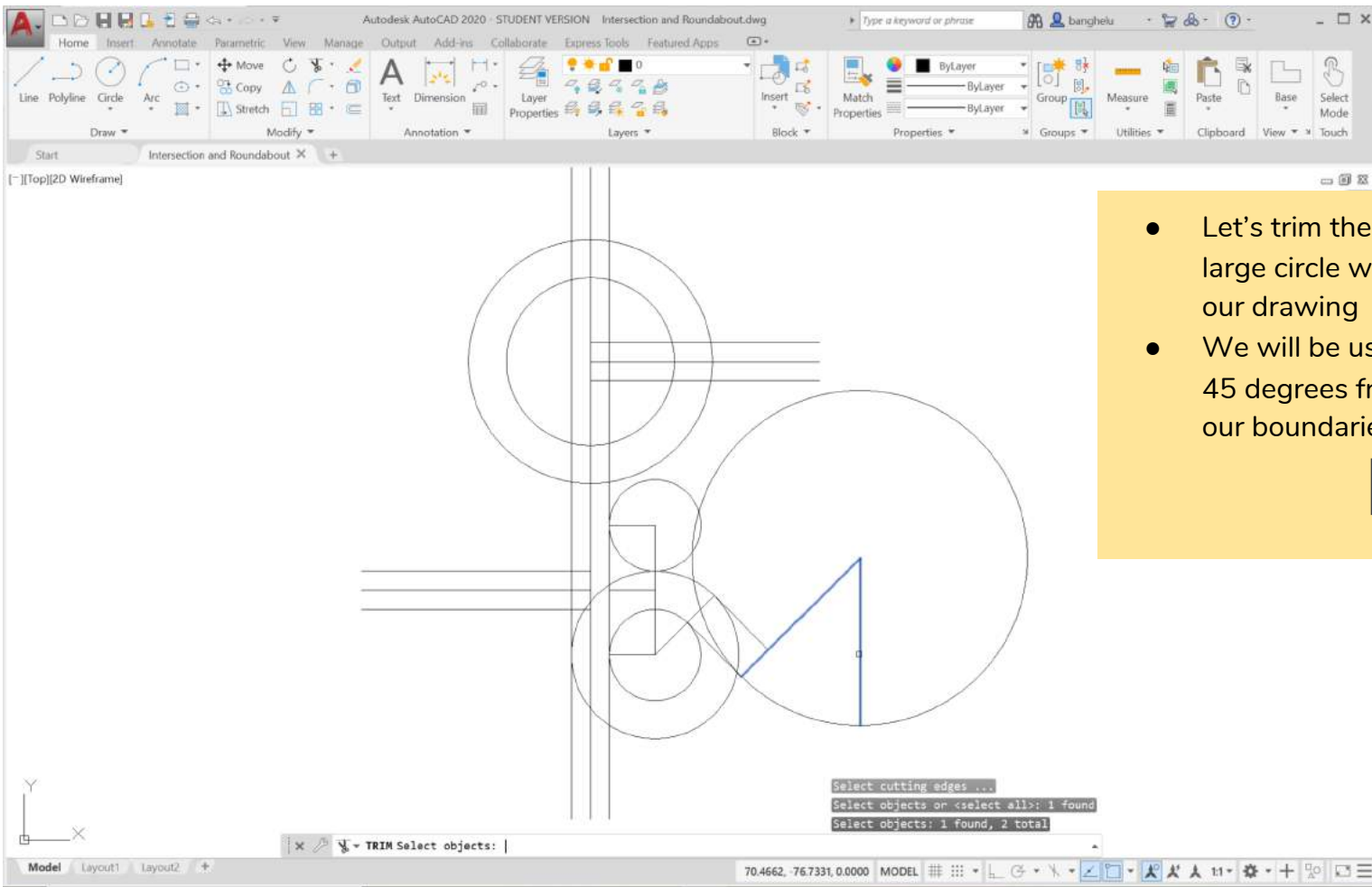
MODE

MODE


MODE

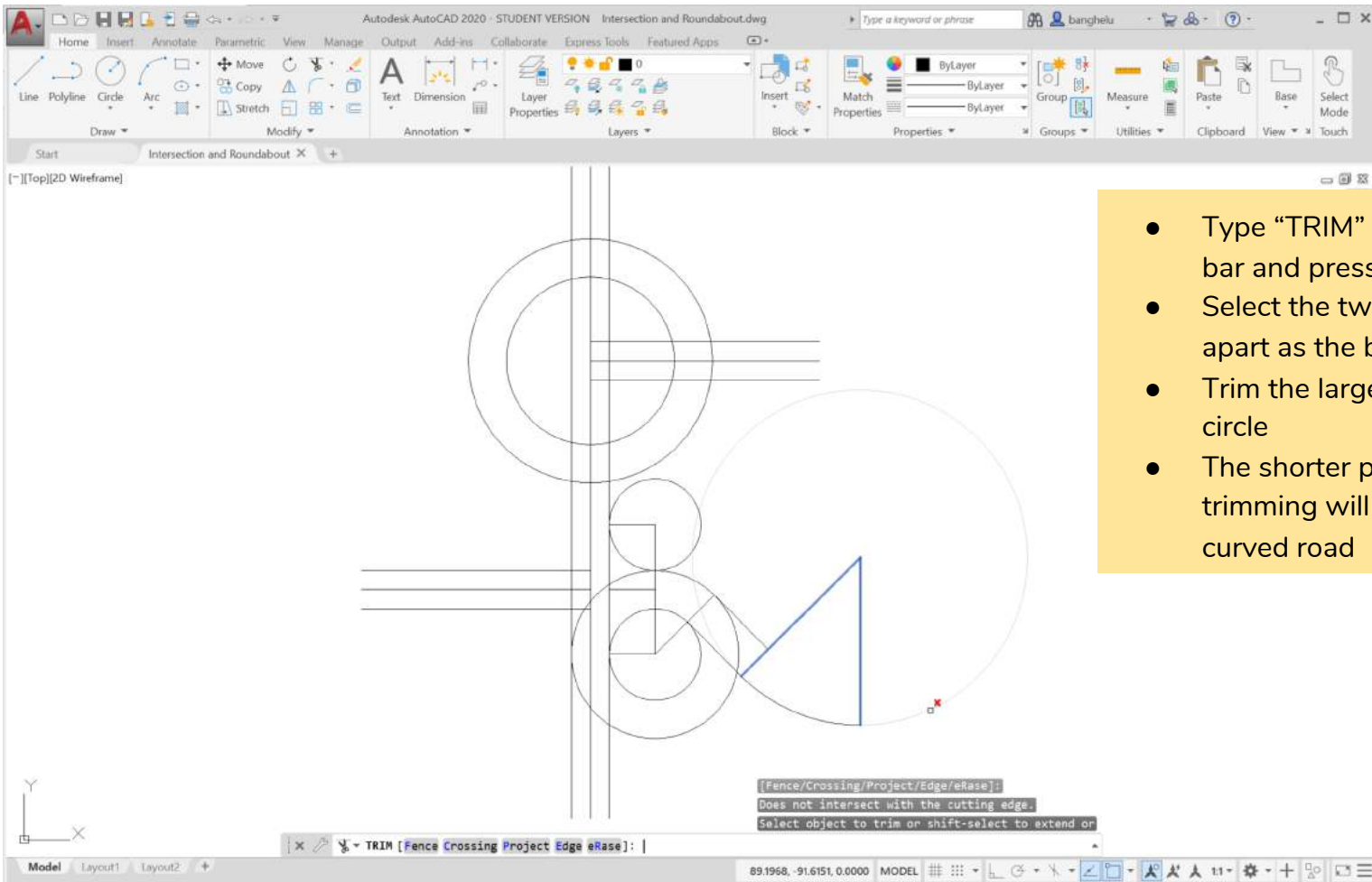
MODE

MODE

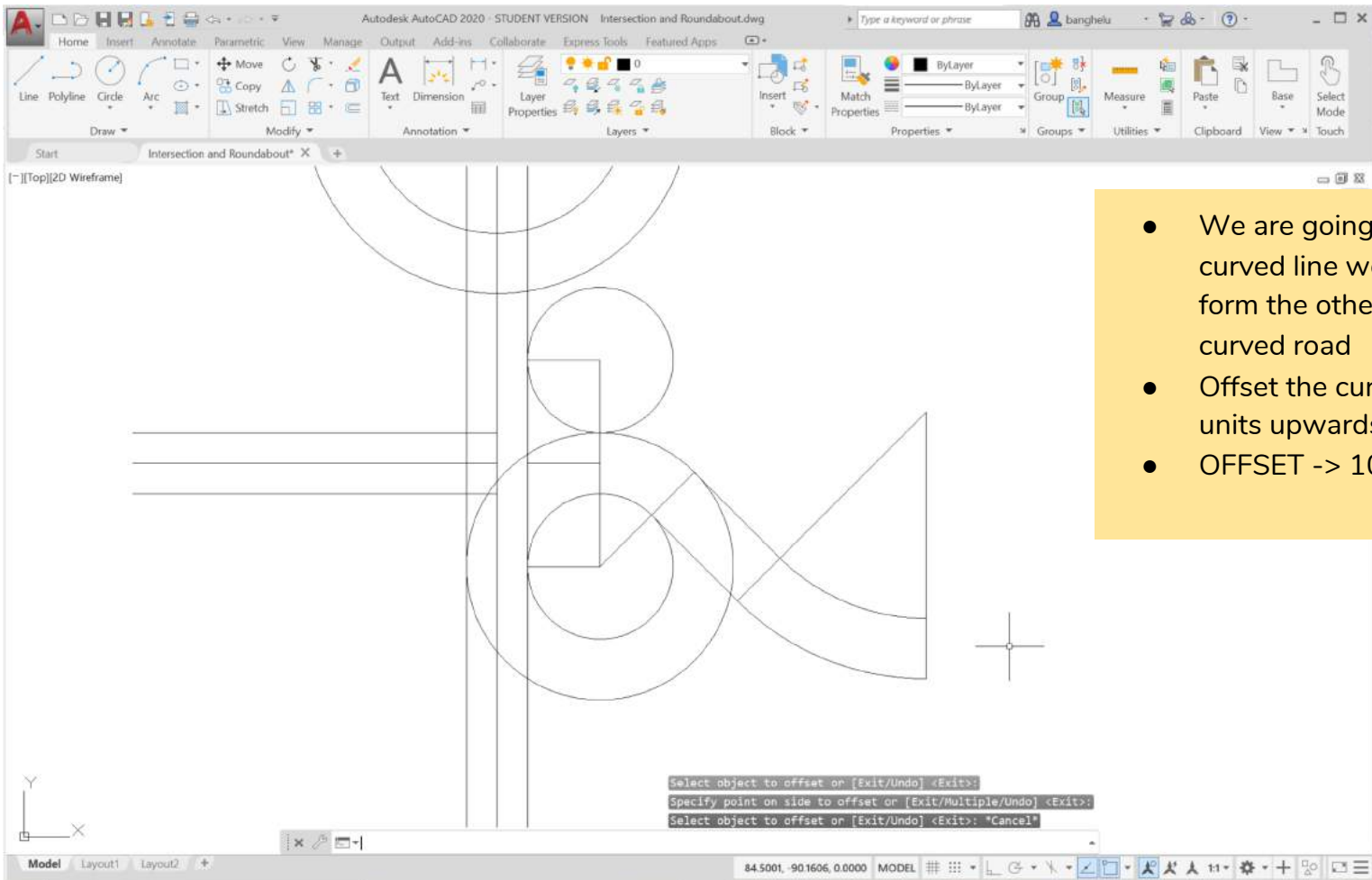


- Let's trim the portion of the large circle we do not need for our drawing
- We will be using the two lines 45 degrees from one another as our boundaries

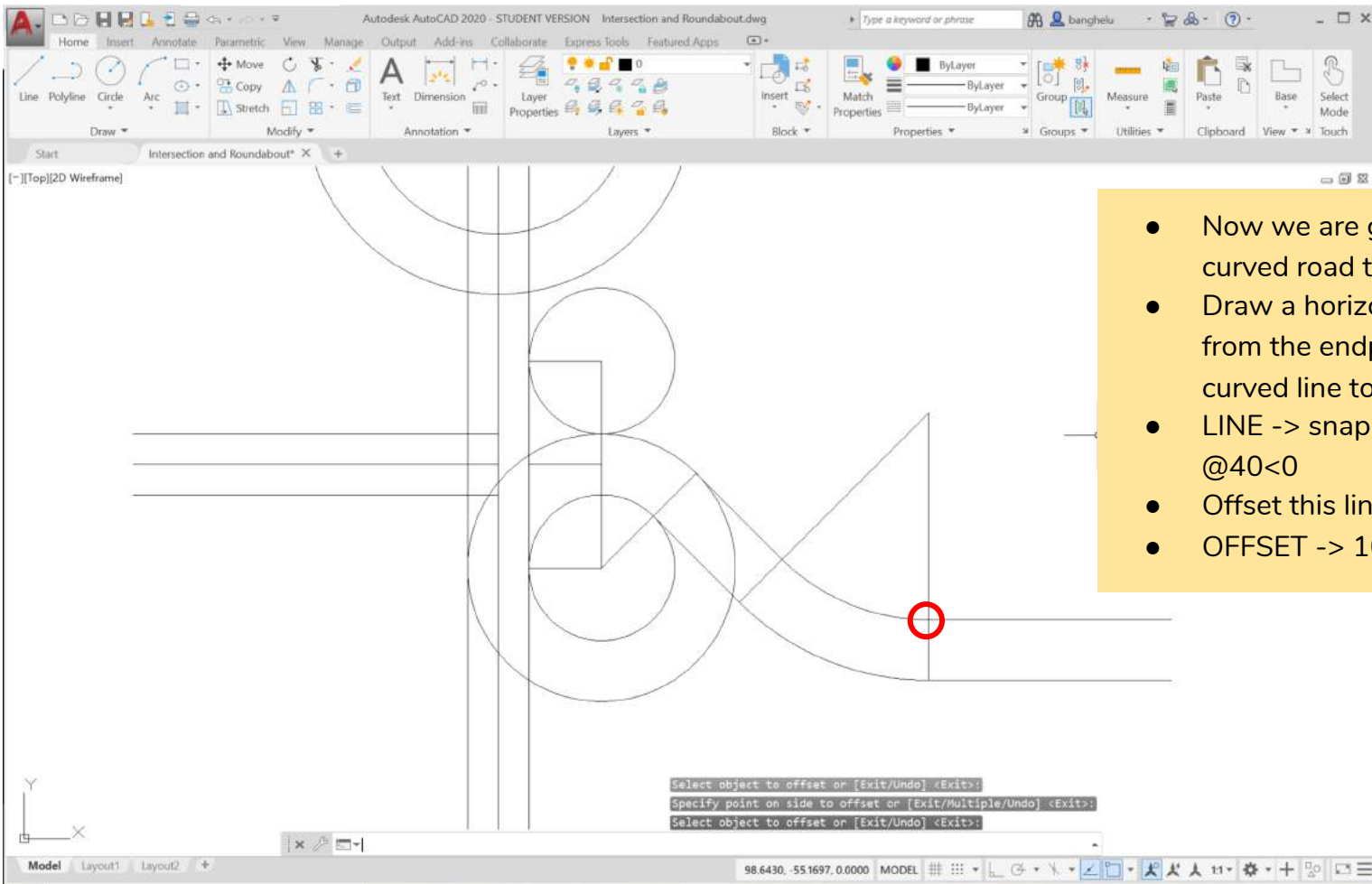
Next
Slide 



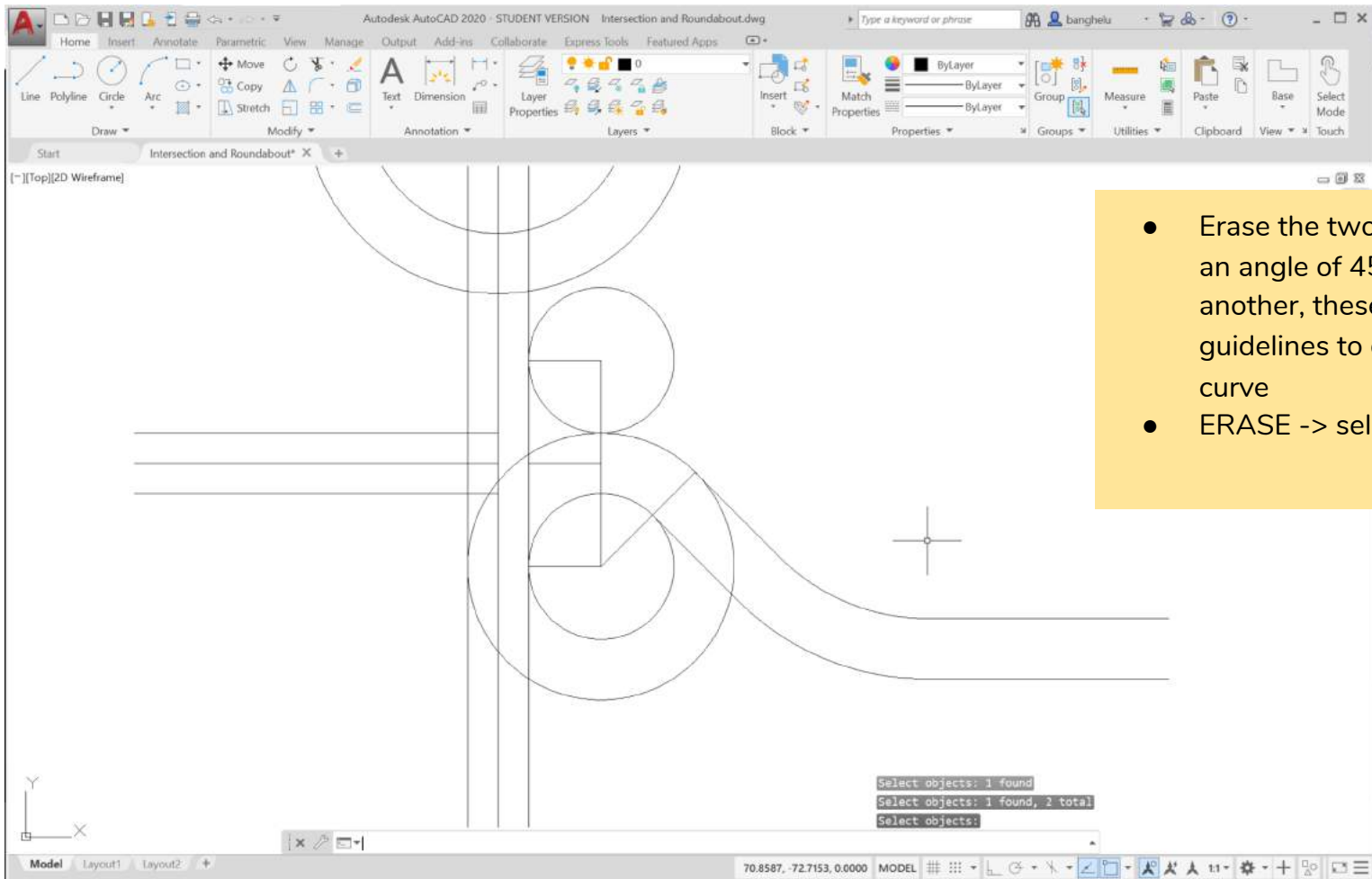
- Type “TRIM” on the command bar and press enter
- Select the two lines 45 degrees apart as the boundaries
- Trim the larger portion of the circle
- The shorter portion we are not trimming will be one side of our curved road

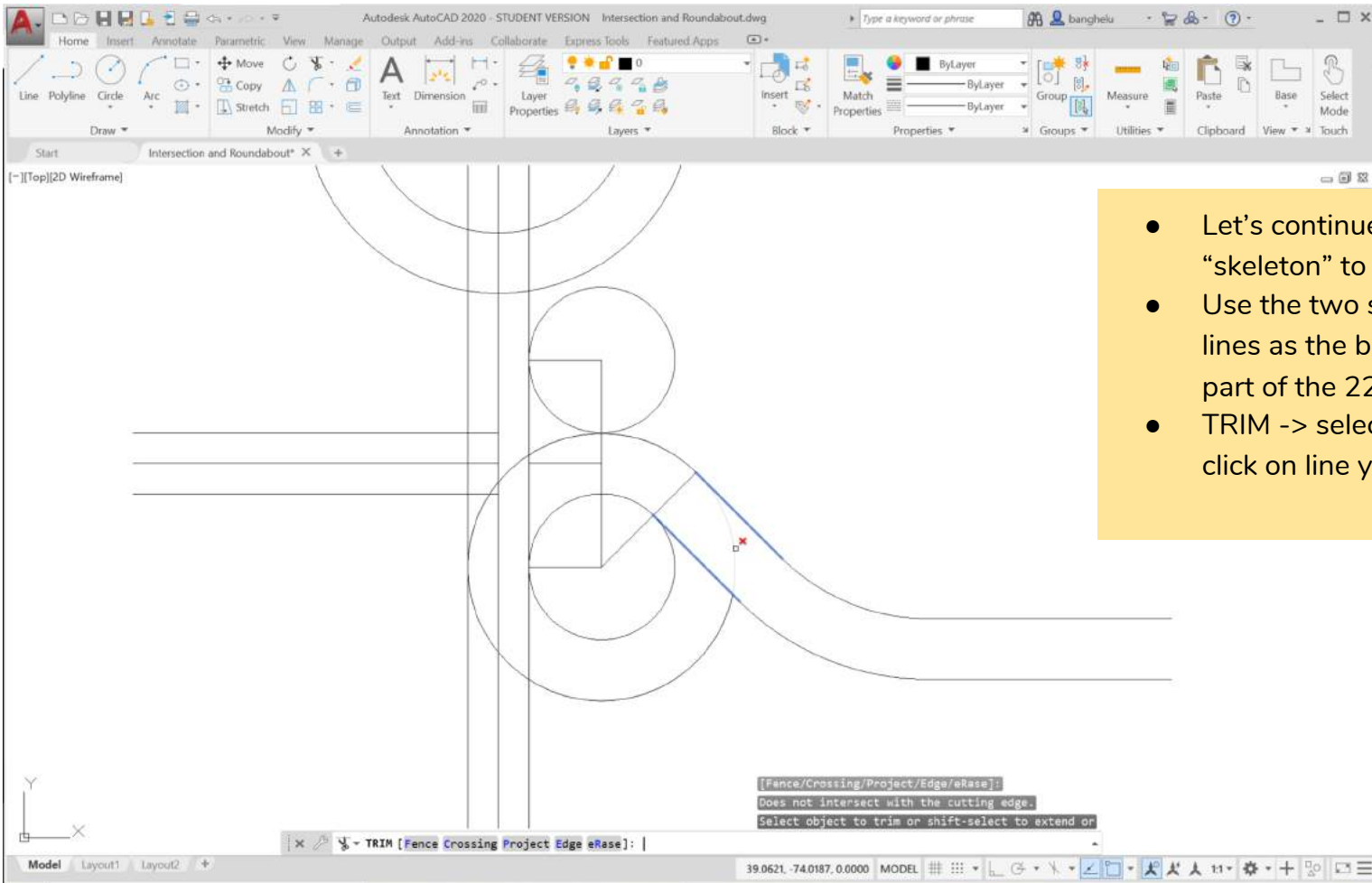


- We are going to offset the curved line we did not trim to form the other side of the curved road
- Offset the curved line by 10 units upwards
- OFFSET -> 10 -> select line

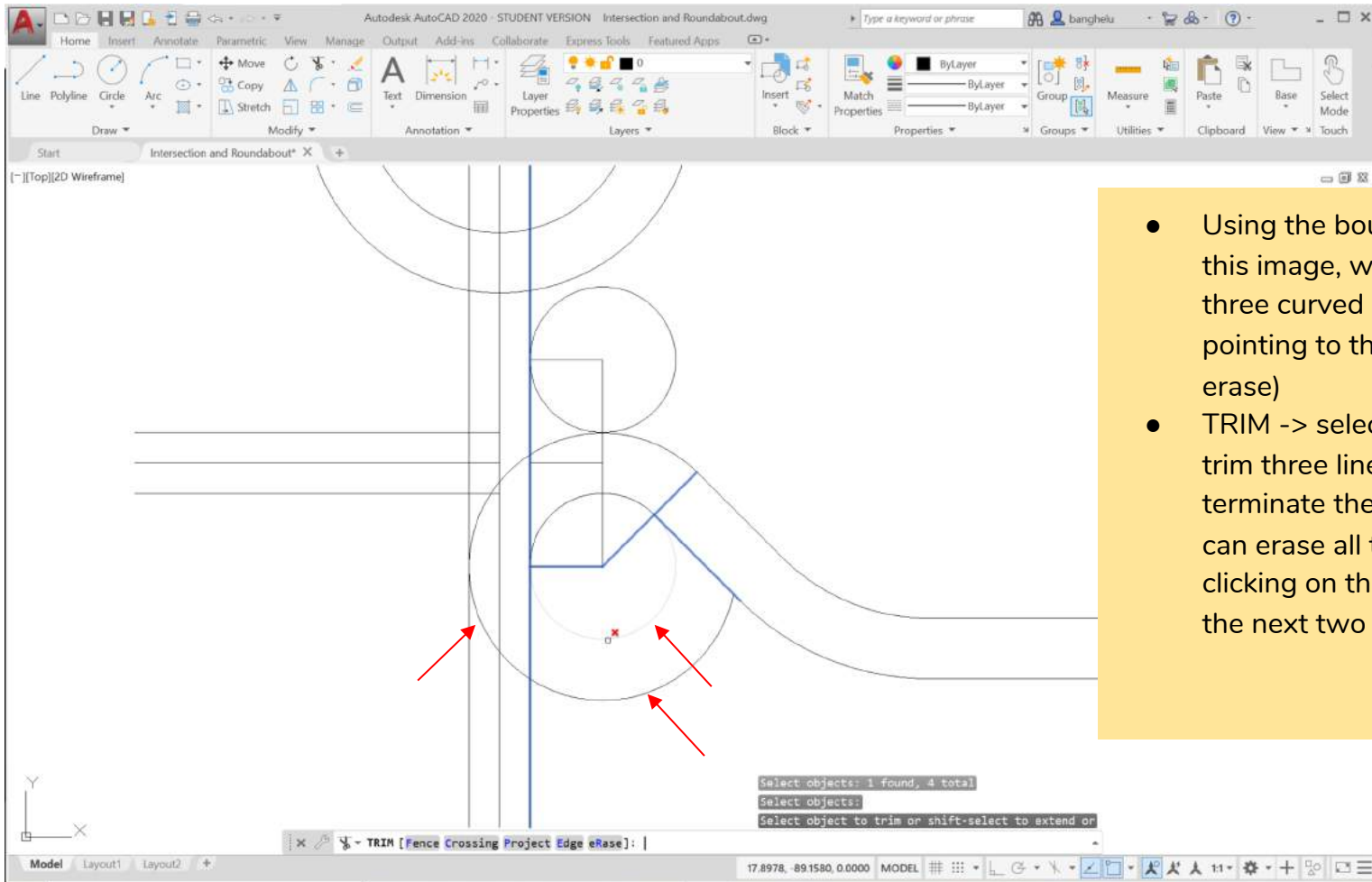


- Now we are going to extend the curved road to the right
- Draw a horizontal line 40 units from the endpoint of the upper curved line to the right
- LINE -> snap endpoint -> @40<0
- Offset this line 10 units down
- OFFSET -> 10 -> select line

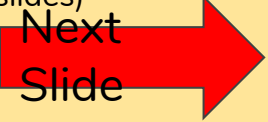


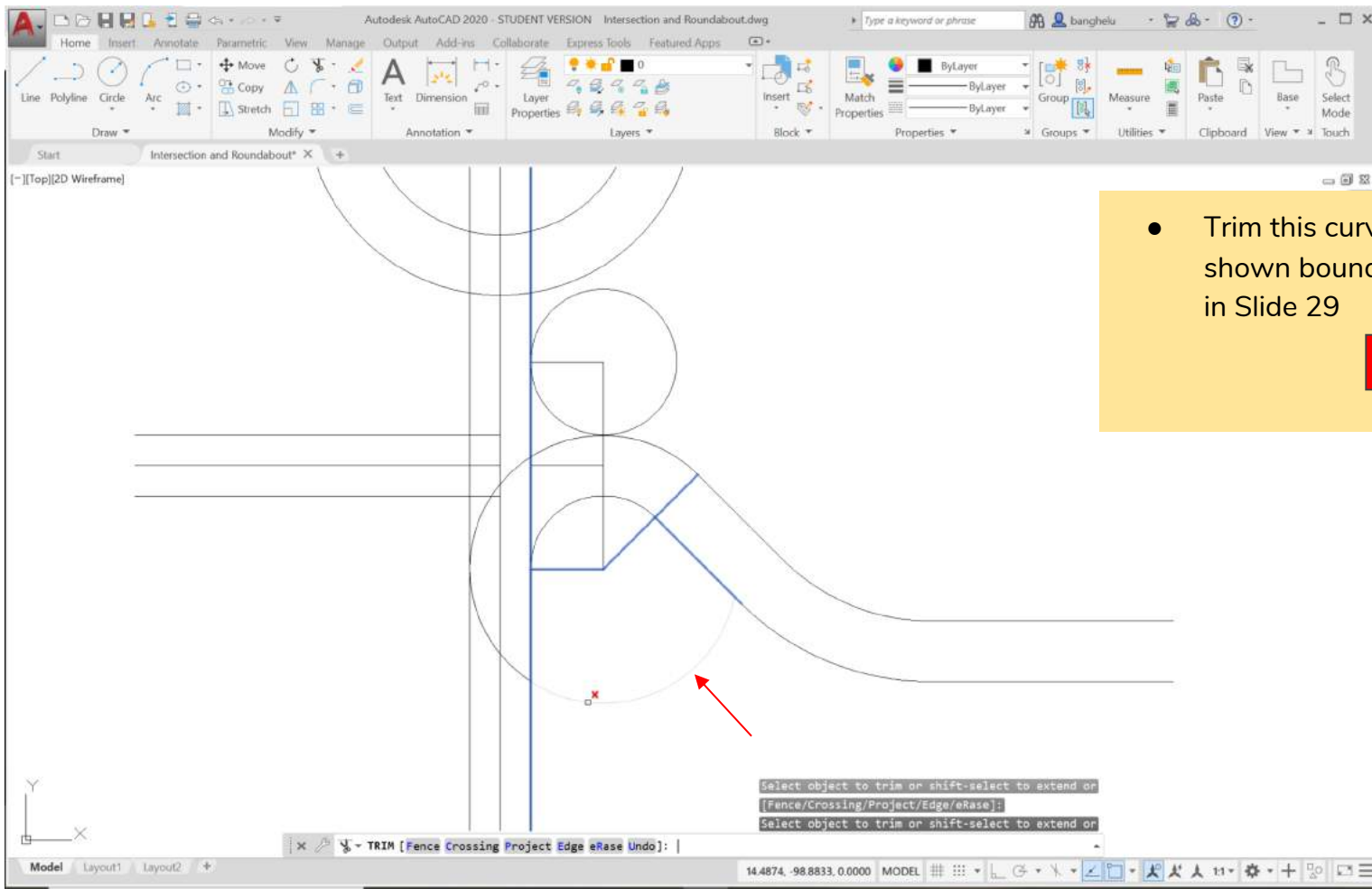


- Let's continue trimming our "skeleton" to reveal our roads
- Use the two straight parallel lines as the boundaries and trim part of the 22 unit circle
- TRIM -> select boundaries -> click on line you want to erase

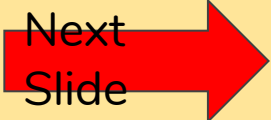


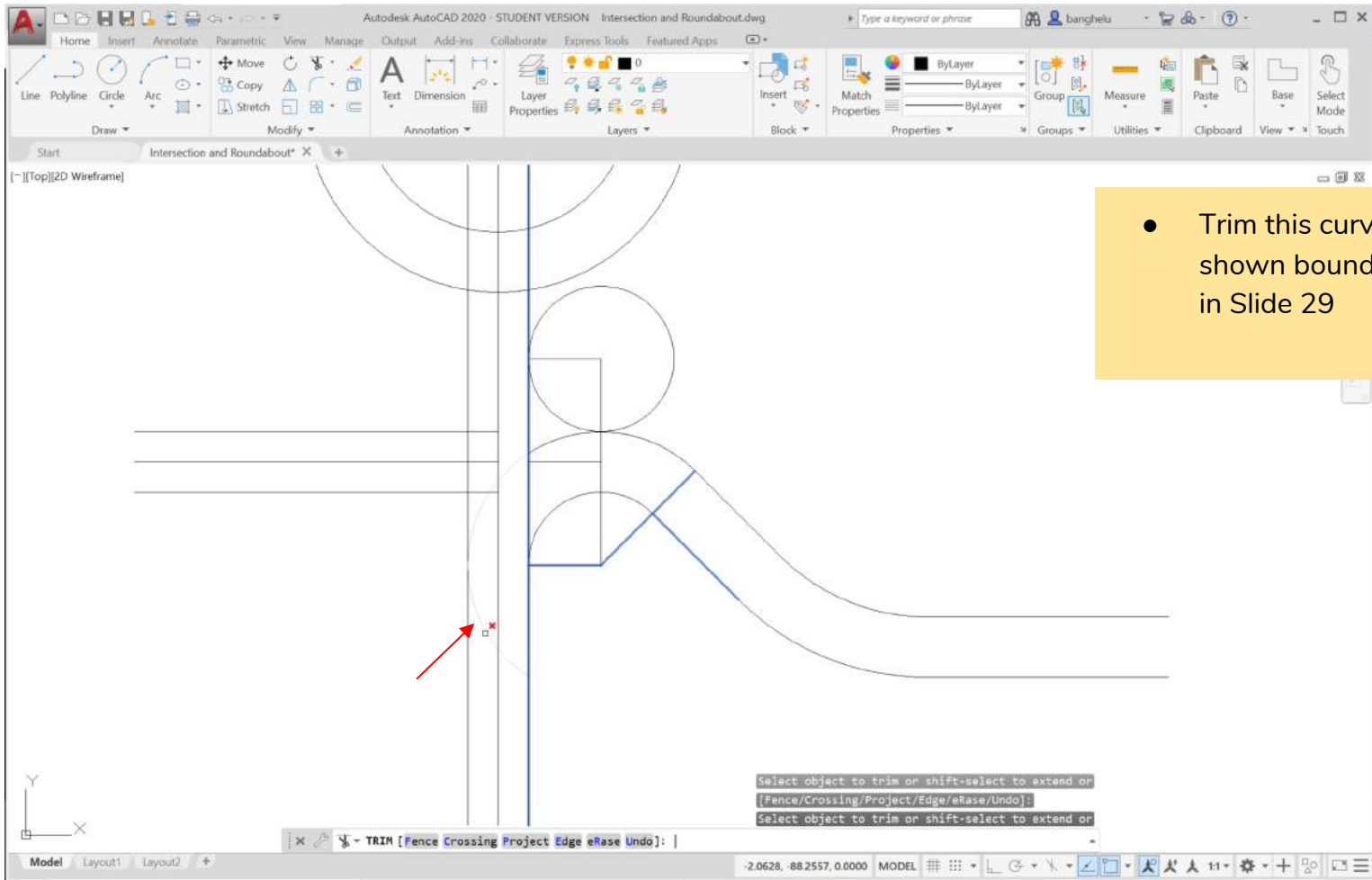
- Using the boundaries shown in this image, we are going to trim three curved lines (arrows pointing to the lines we will erase)
- TRIM -> select boundaries -> trim three lines (do not terminate the command and you can erase all three lines by clicking on them as shown in the next two slides)

Next
Slide 

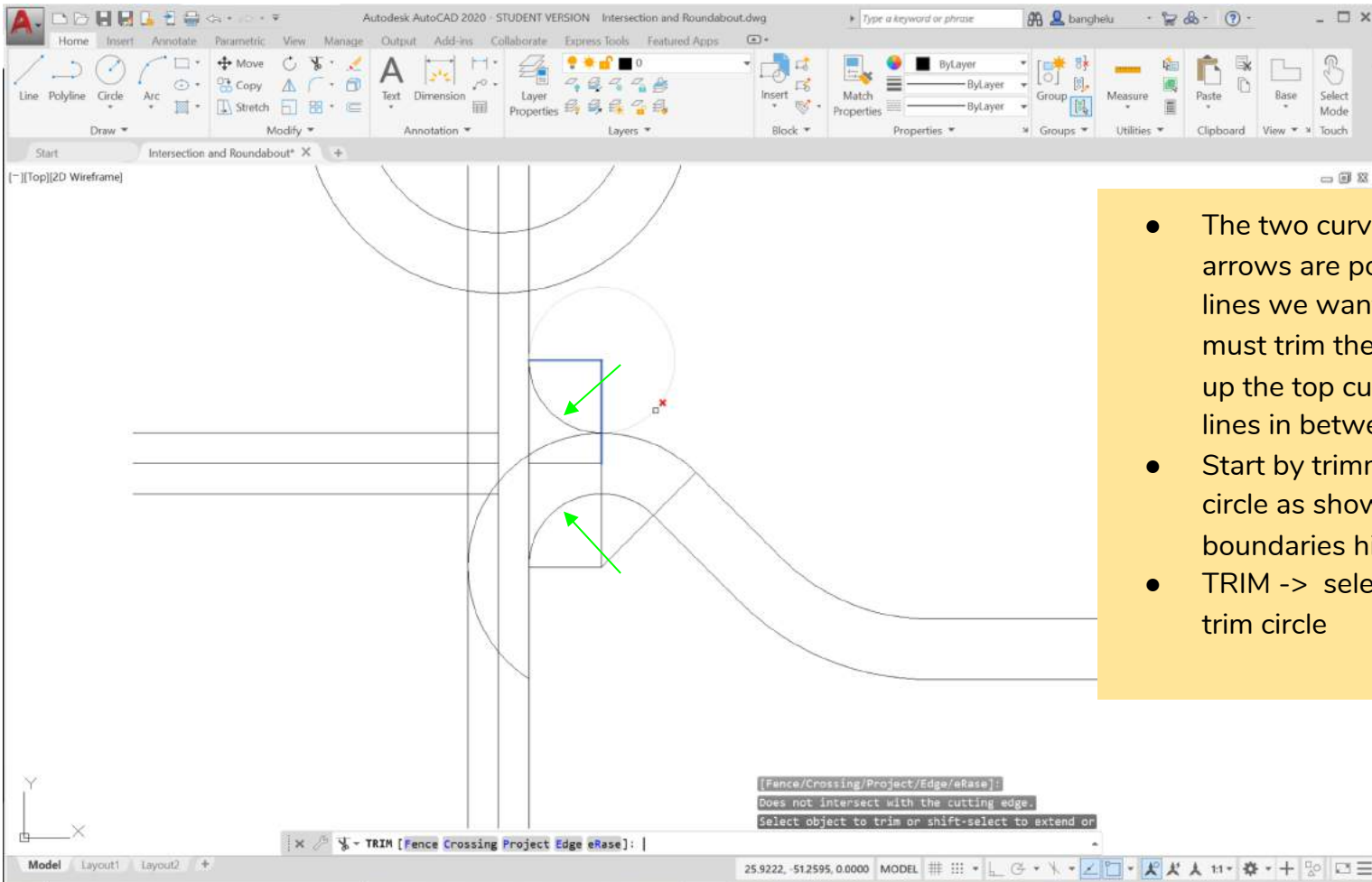


- Trim this curved line using the shown boundaries as explained in Slide 29

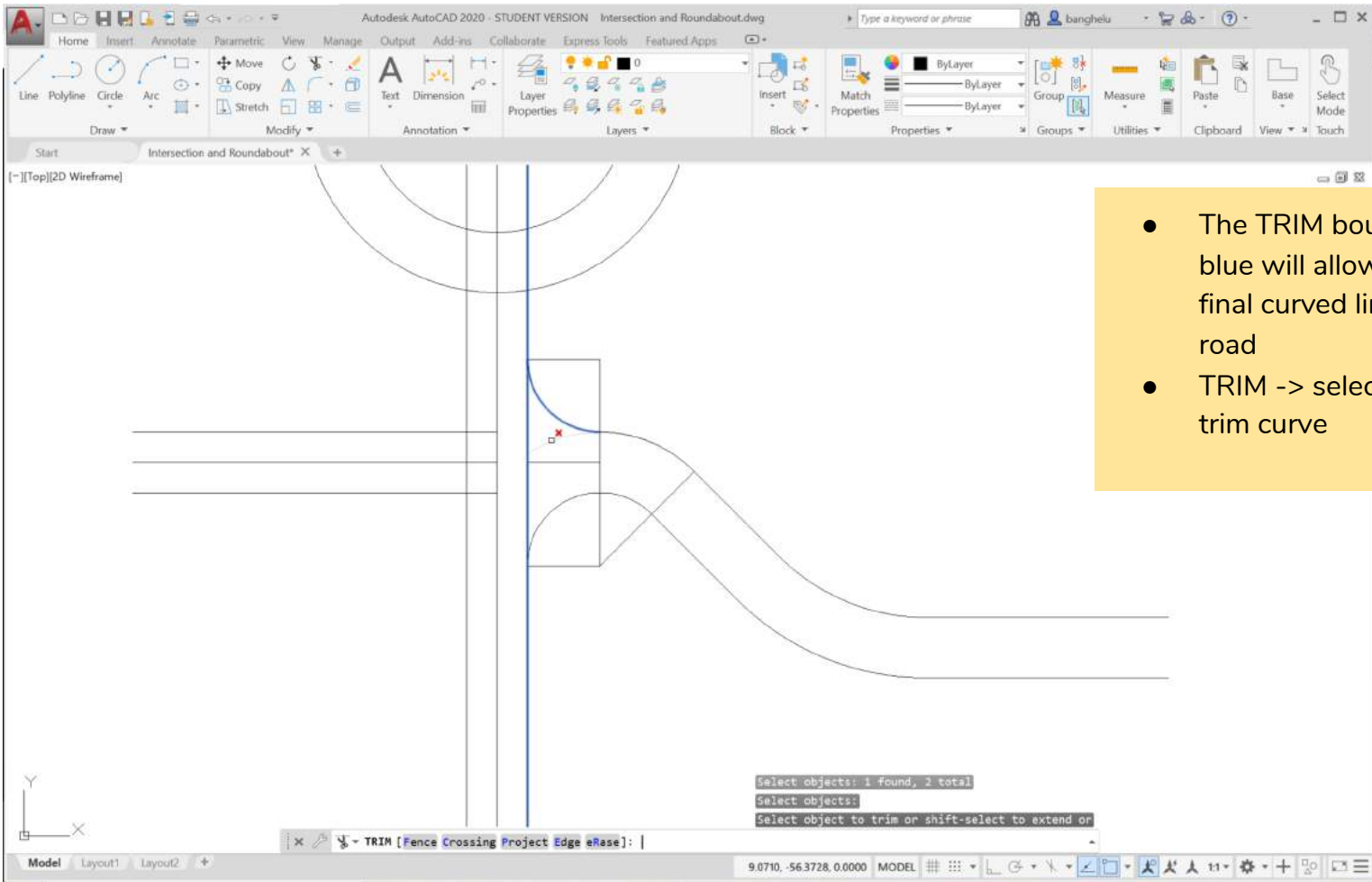
Next Slide 



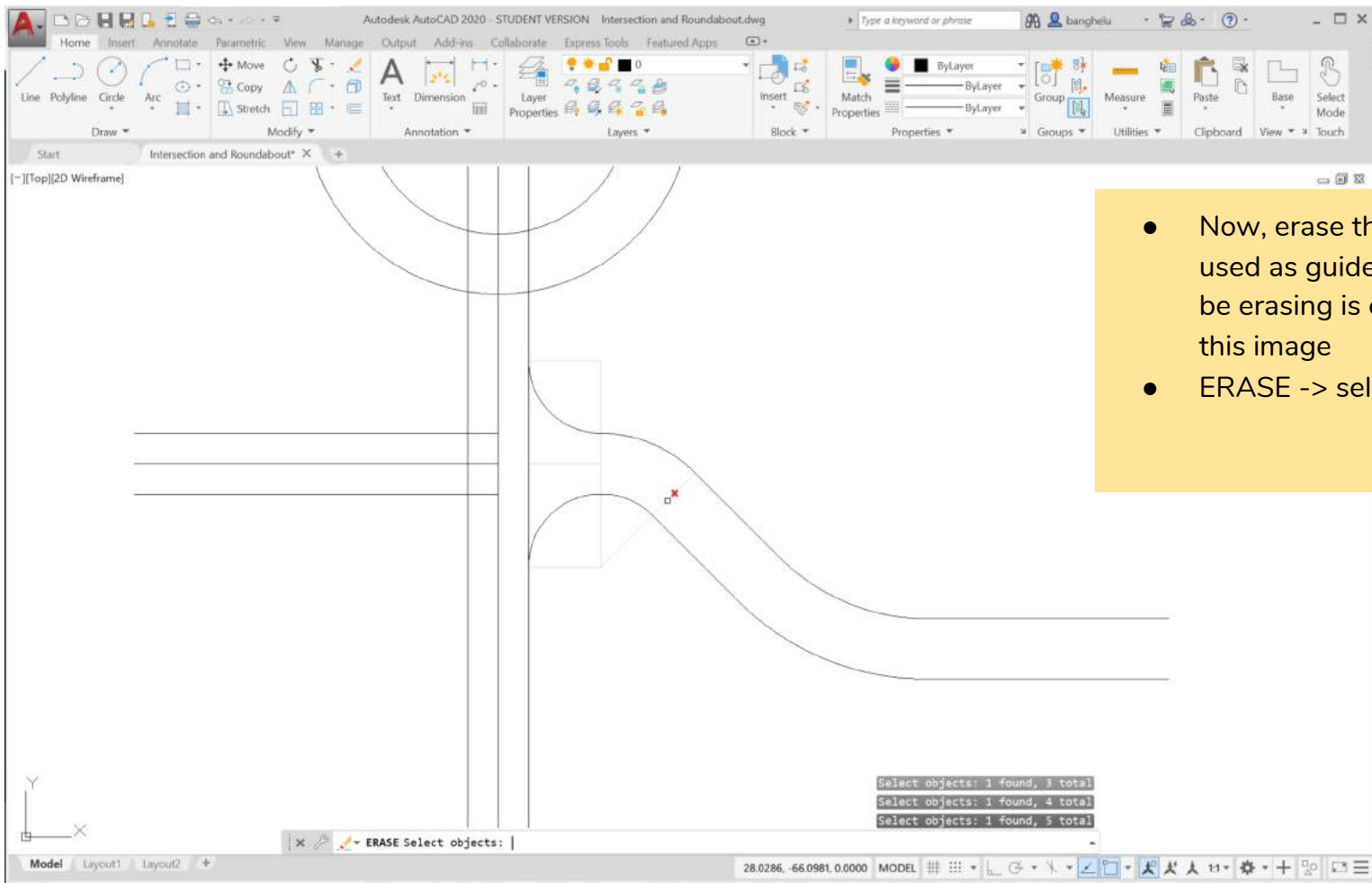
- Trim this curved line using the shown boundaries as explained in Slide 29



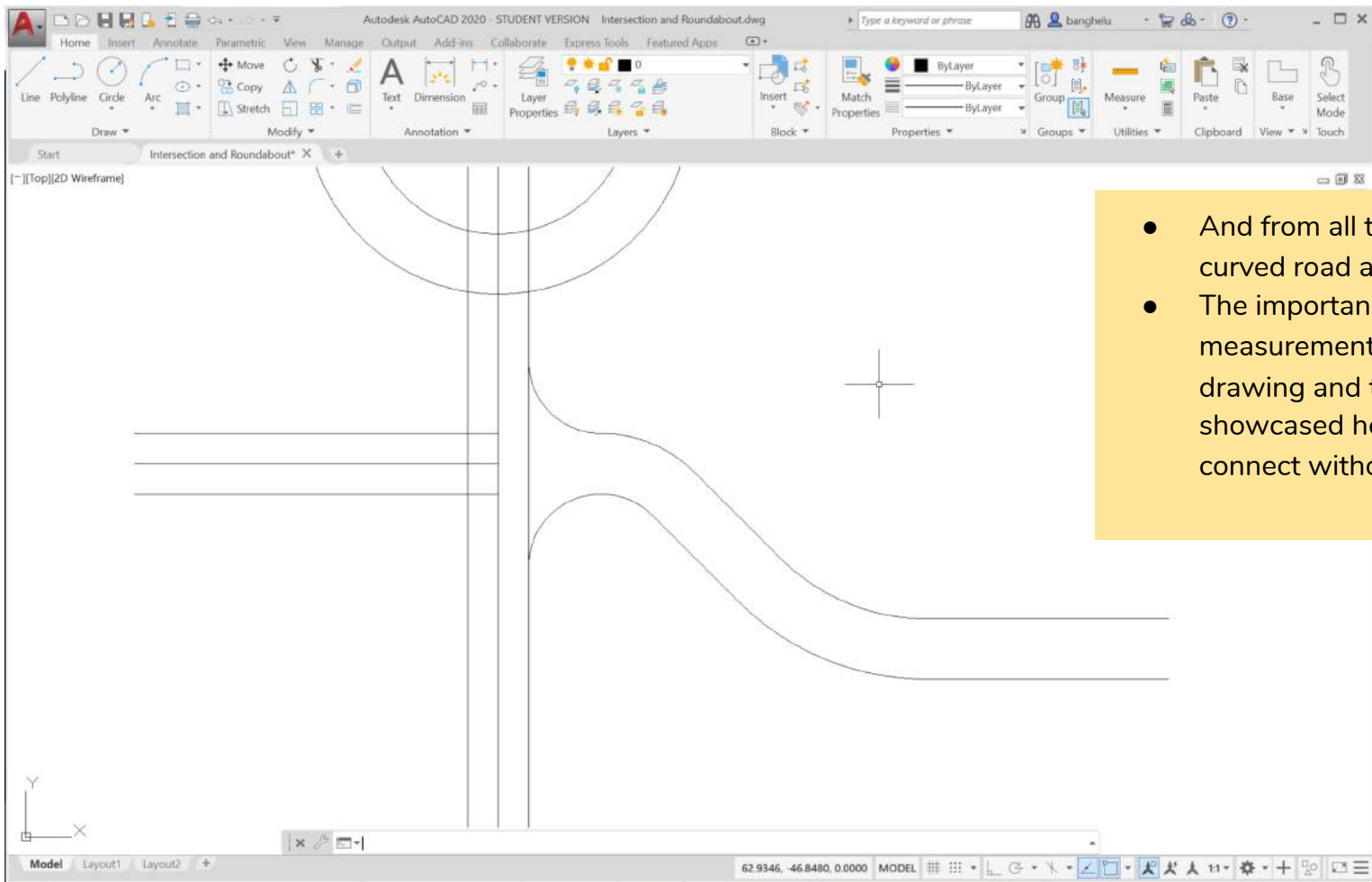
- The two curved lines the green arrows are pointing to are the lines we want to **keep**, so we must trim the circle that makes up the top curve and the curved lines in between these two lines
- Start by trimming the upper circle as shown here, set the boundaries highlighted in green
- TRIM -> select boundaries -> trim circle



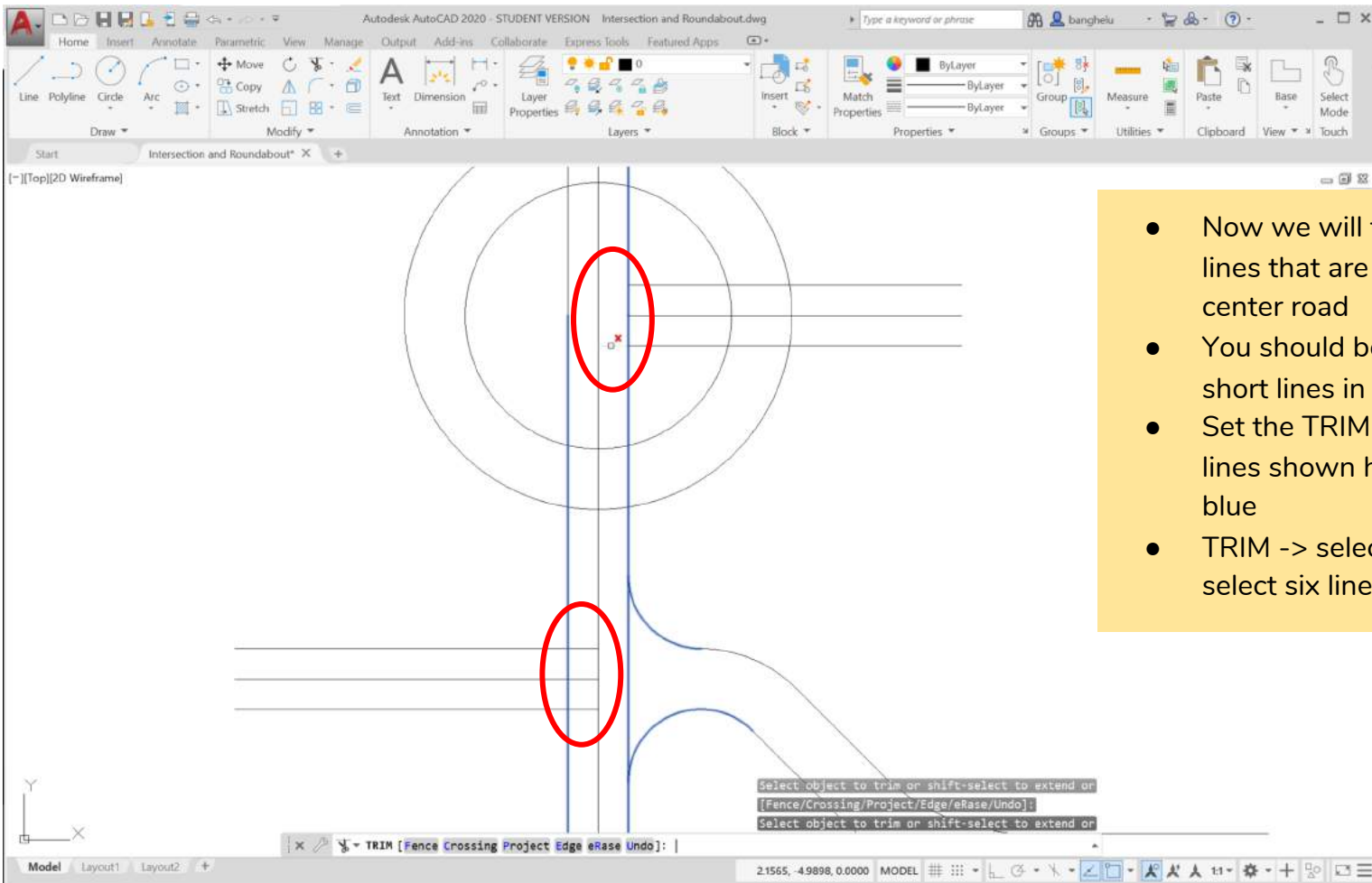
- The TRIM boundaries shown in blue will allow us to trim the final curved line inside of our road
- TRIM -> select boundaries -> trim curve



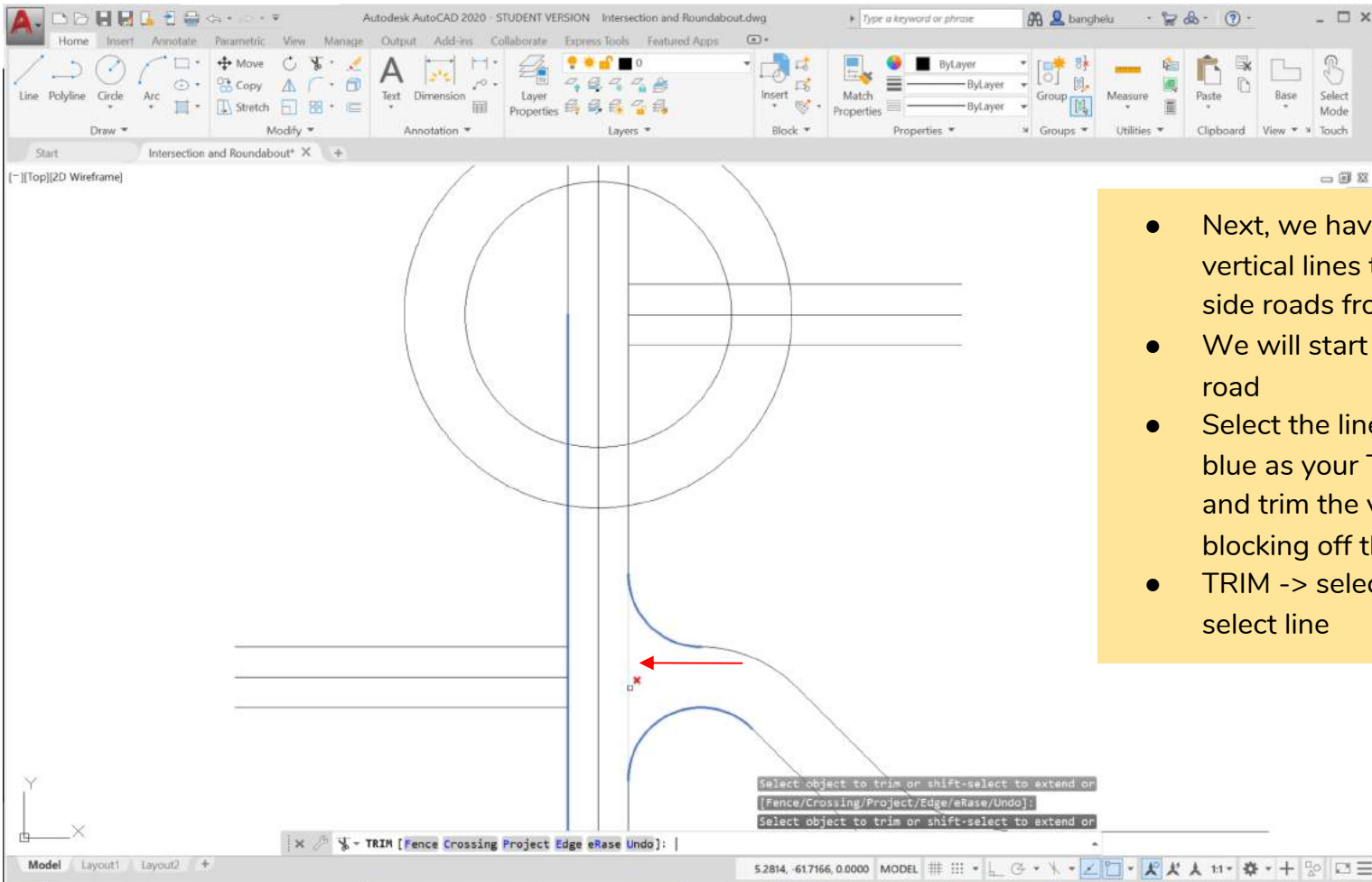
- Now, erase the linework we used as guidelines, what we will be erasing is coloured gray in this image
- ERASE -> select lines <enter>



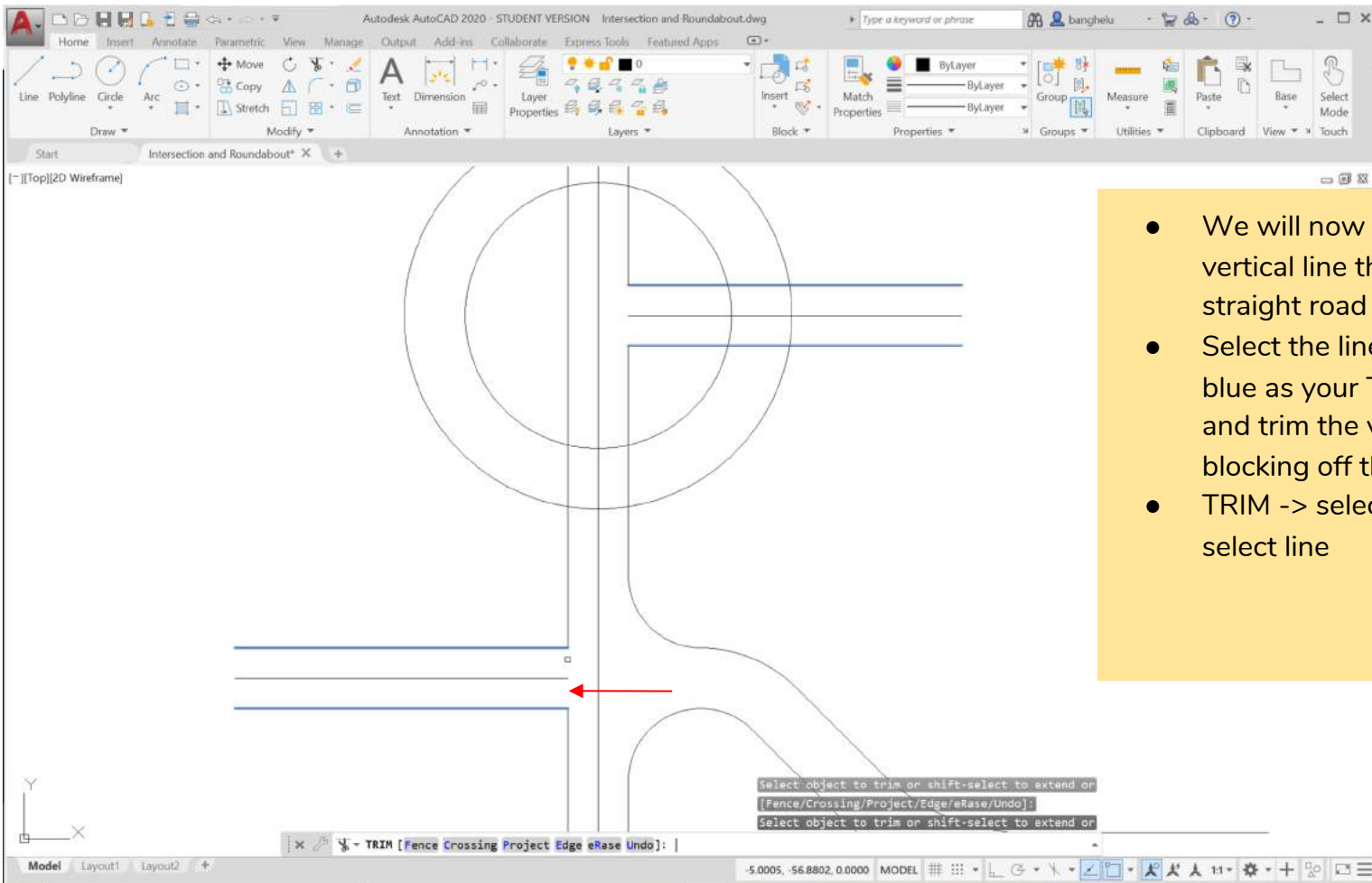
- And from all that trimming, a curved road appears!
- The importance of exact measurements and careful drawing and trimming is showcased here as all the lines connect without any gaps



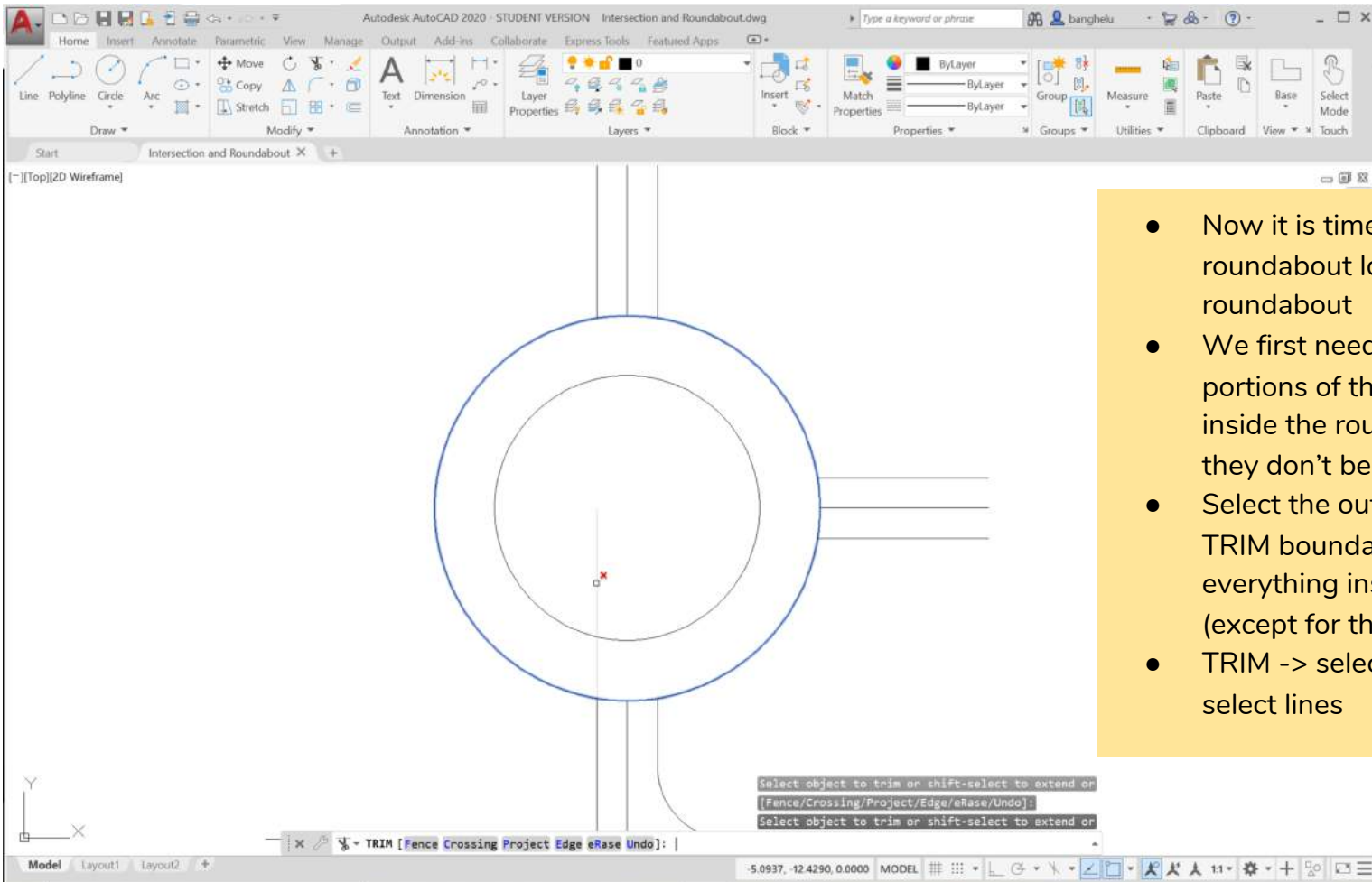
- Now we will trim the horizontal lines that are crossing into our center road
- You should be trimming six short lines in total
- Set the TRIM boundaries as the lines shown here highlighted in blue
- TRIM -> select boundaries -> select six lines



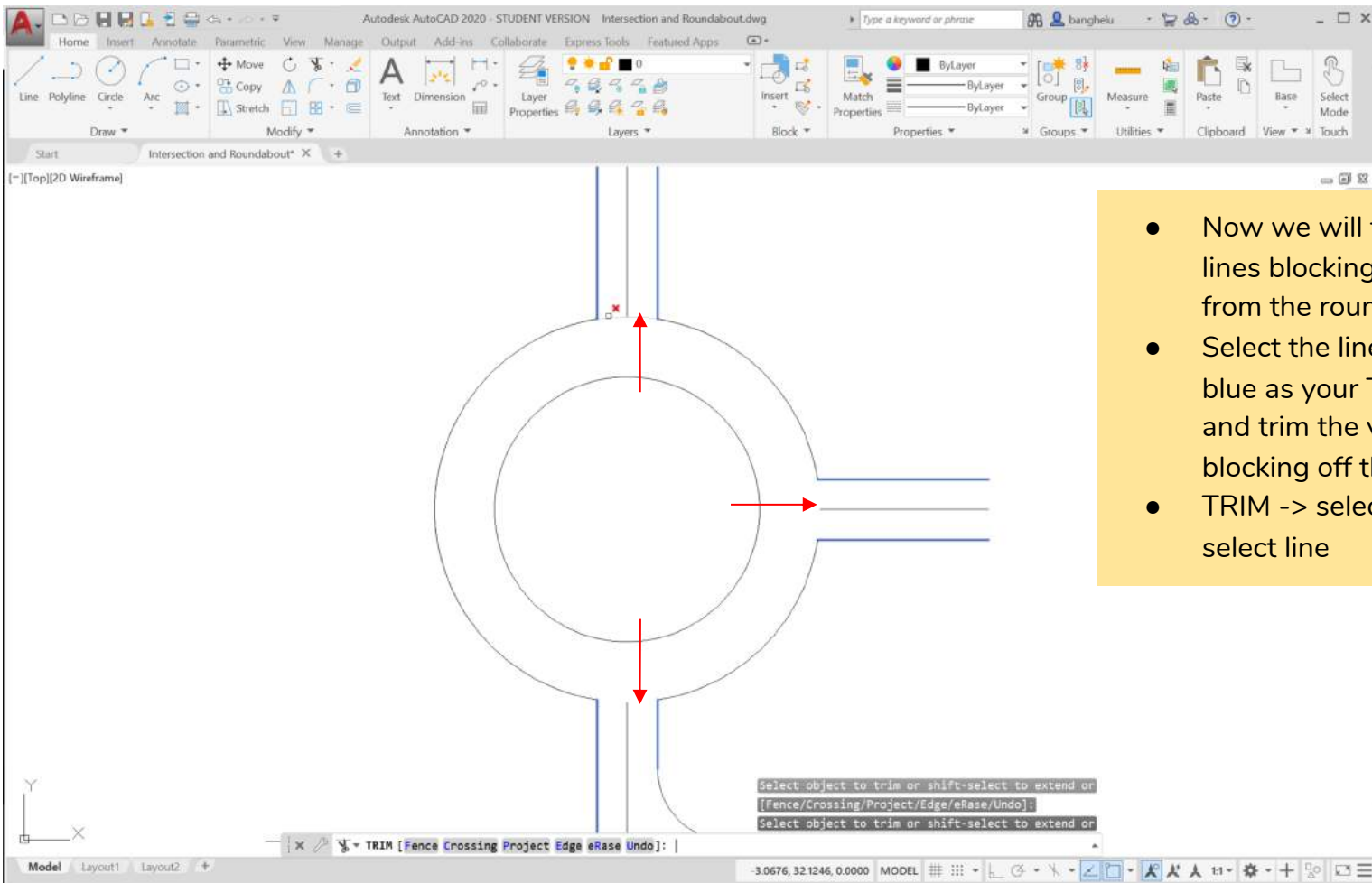
- Next, we have to trim the vertical lines that block off the side roads from the centre road
- We will start with the curved road
- Select the lines highlighted in blue as your TRIM boundaries and trim the vertical line blocking off the curved road
- TRIM -> select boundaries -> select line



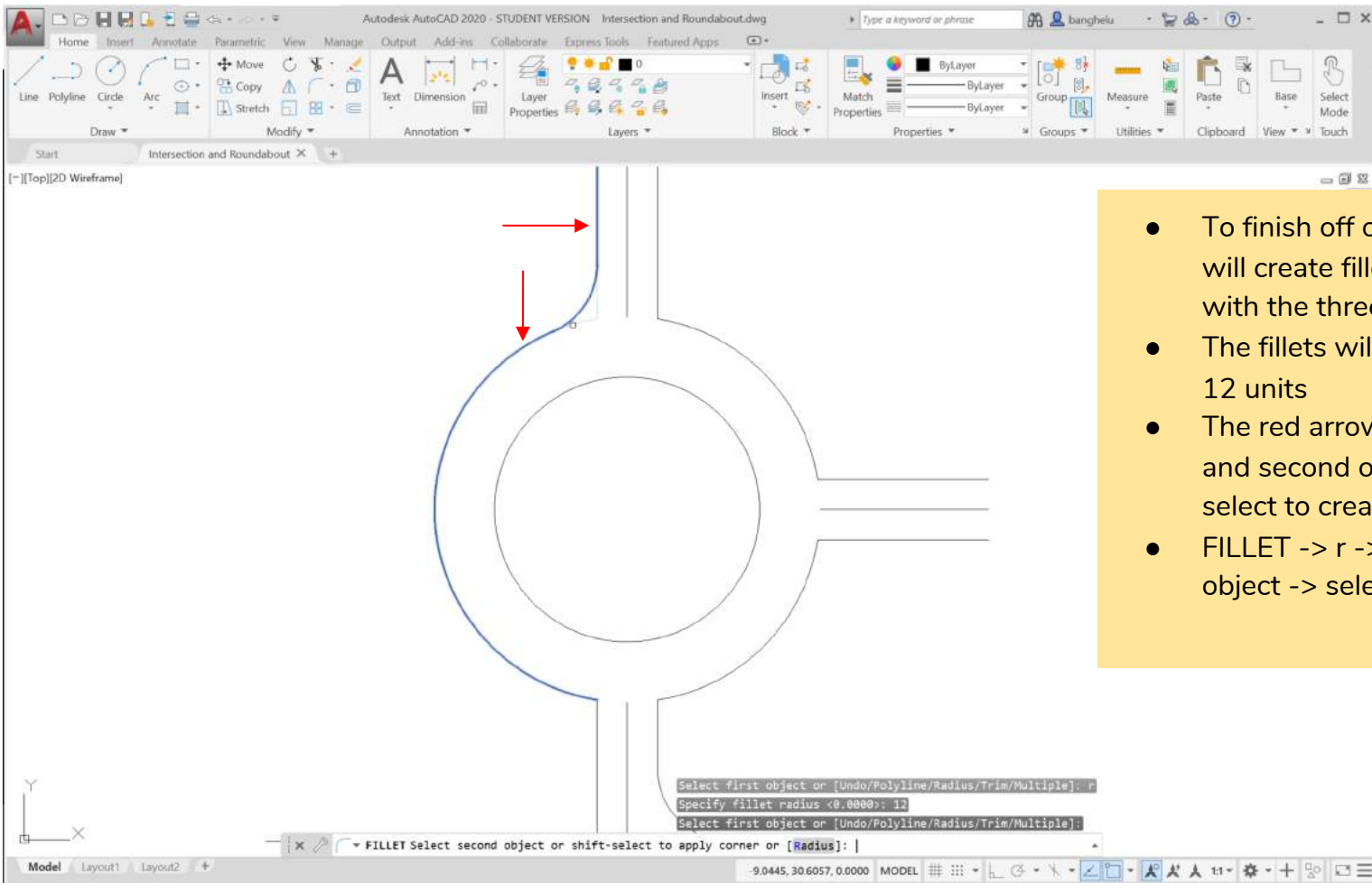
- We will now be trimming the vertical line that is blocking the straight road in the intersection
- Select the lines highlighted in blue as your TRIM boundaries and trim the vertical line blocking off the roads
- TRIM -> select boundaries -> select line

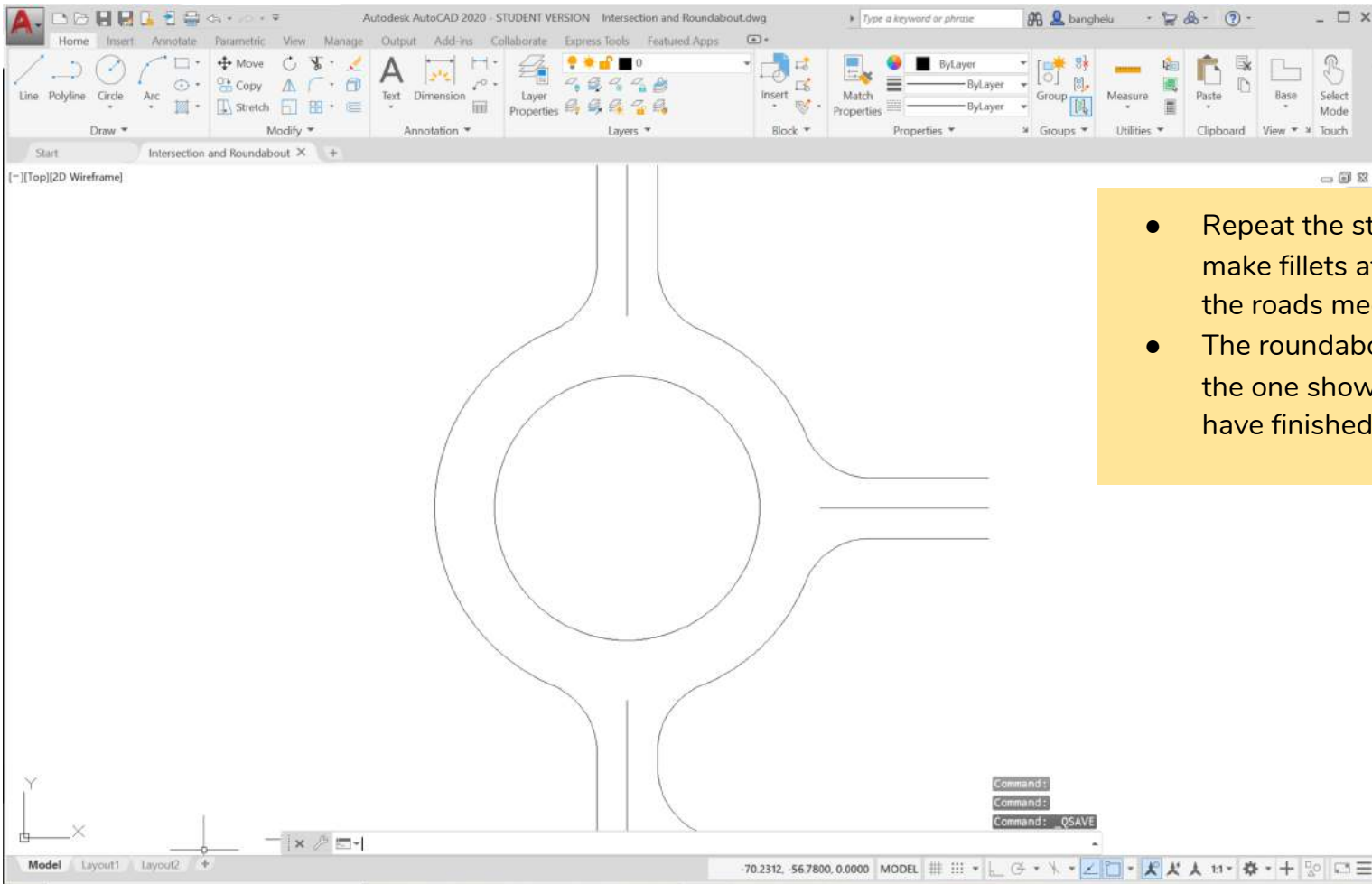


- Now it is time to make our roundabout look like more of a roundabout
- We first need to trim the portions of the road that are inside the roundabout (where they don't belong)
- Select the outer circle as the TRIM boundary and trim everything inside the circle (except for the smaller circle)
- TRIM -> select boundaries -> select lines

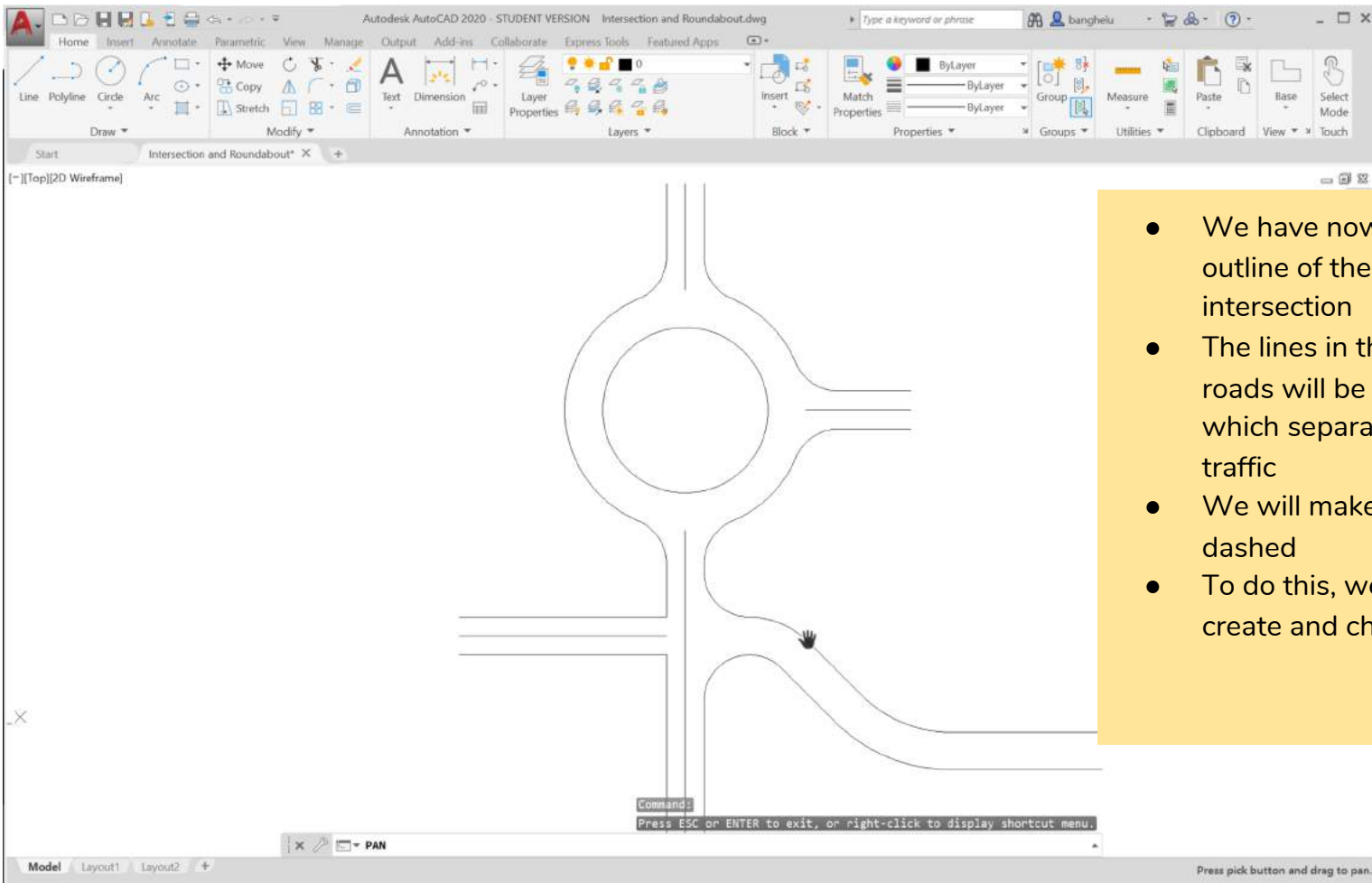


- Now we will trim the curved lines blocking the three roads from the roundabout
- Select the lines highlighted in blue as your TRIM boundaries and trim the vertical line blocking off the roads
- TRIM -> select boundaries -> select line

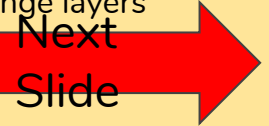


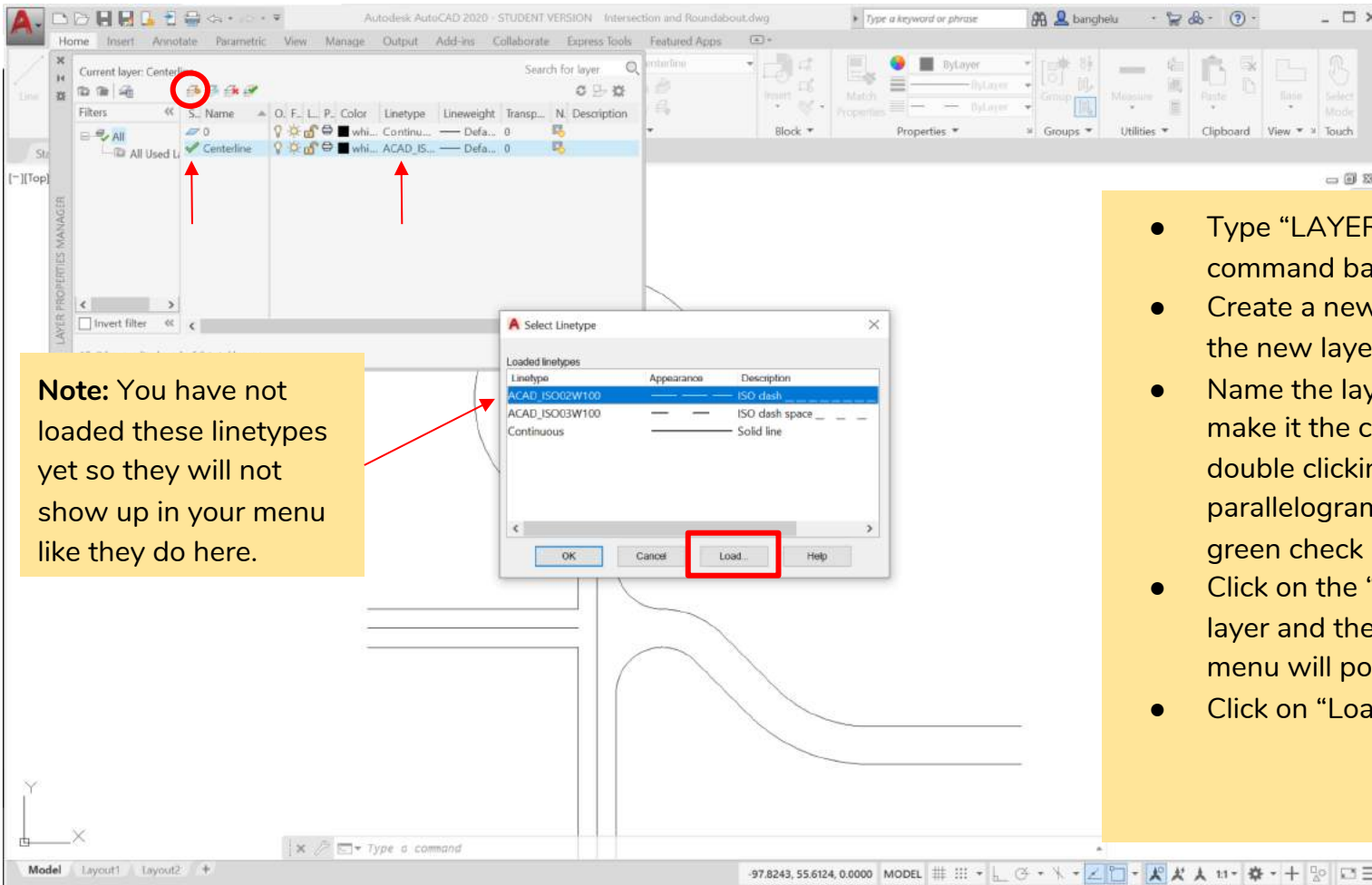


- Repeat the steps on Slide 41 to make fillets at all points where the roads meet the roundabout
- The roundabout should look like the one shown here when you have finished making fillets

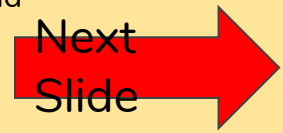


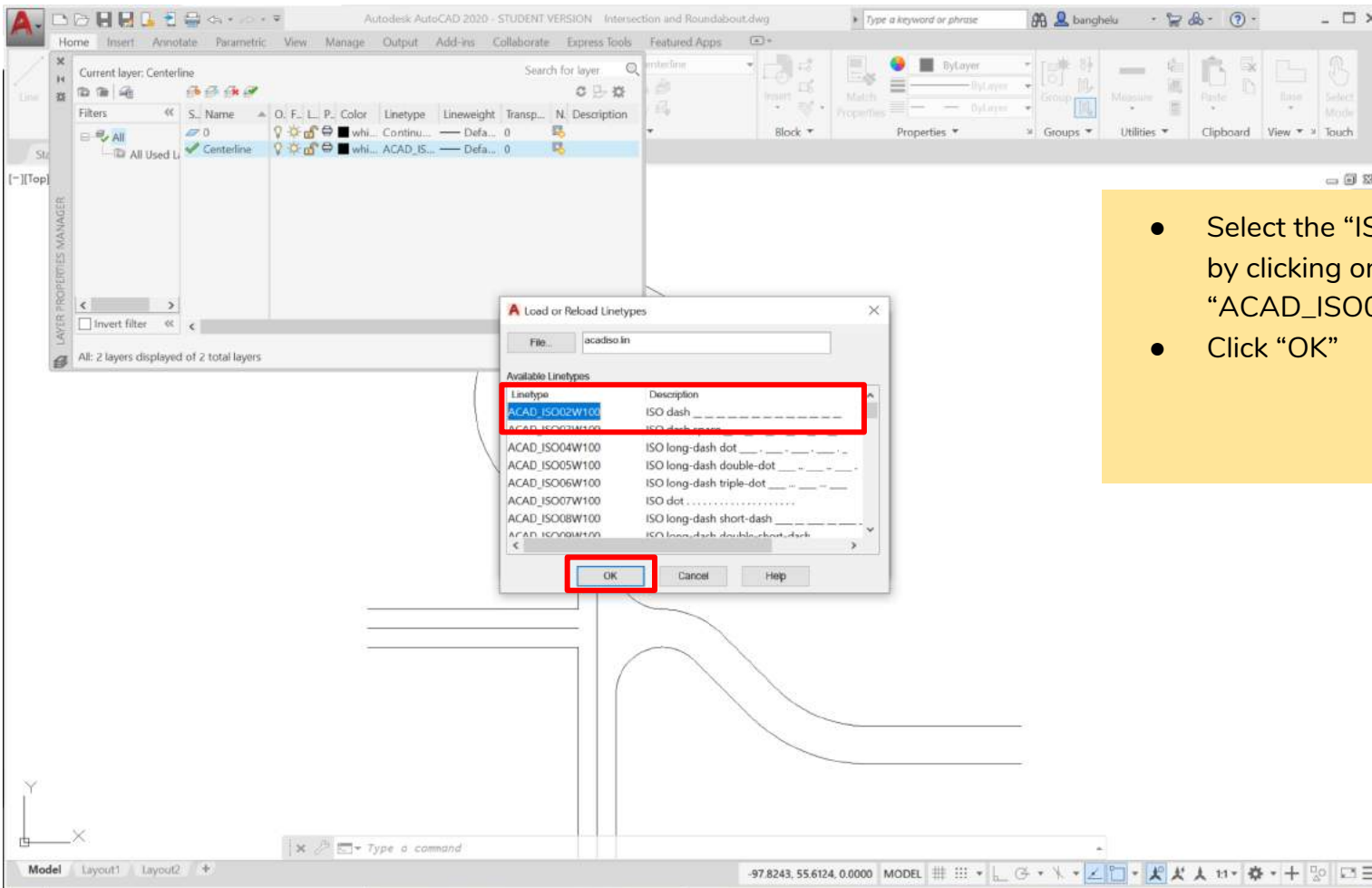
- We have now finished the basic outline of the roundabout and intersection
- The lines in the center of the roads will be the centerline which separate opposite flowing traffic
- We will make this centerline dashed
- To do this, we will have to create and change layers



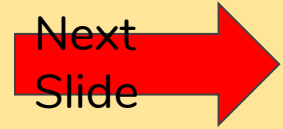


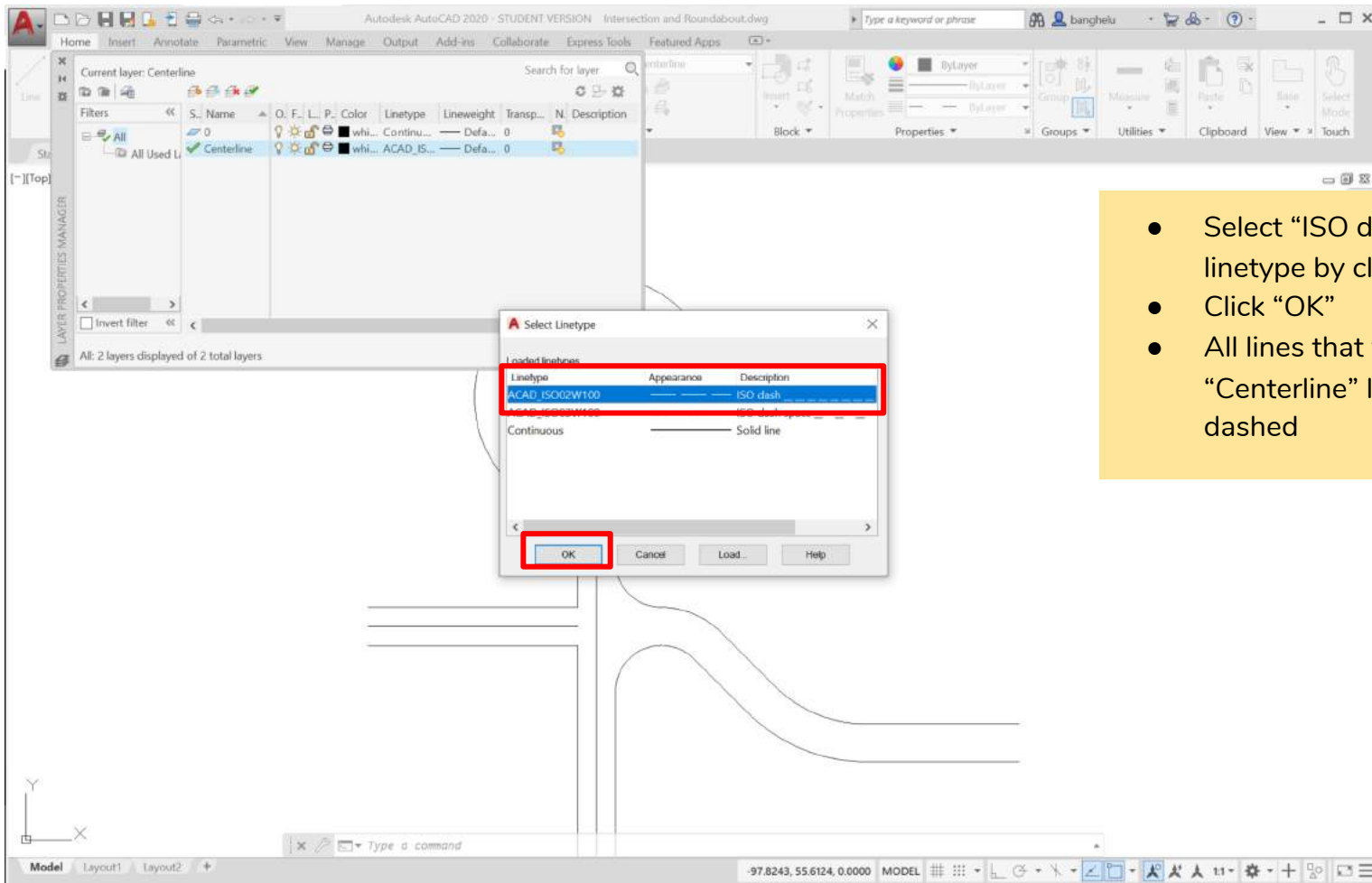
- Type “LAYER” into the command bar and press enter
- Create a new layer by pressing the new layer icon
- Name the layer “Centerline” and make it the current layer by double clicking on the blue parallelogram, it will turn into a green check mark
- Click on the “Linetype” of that layer and the “Select Linetype” menu will pop up
- Click on “Load”

Next
Slide 

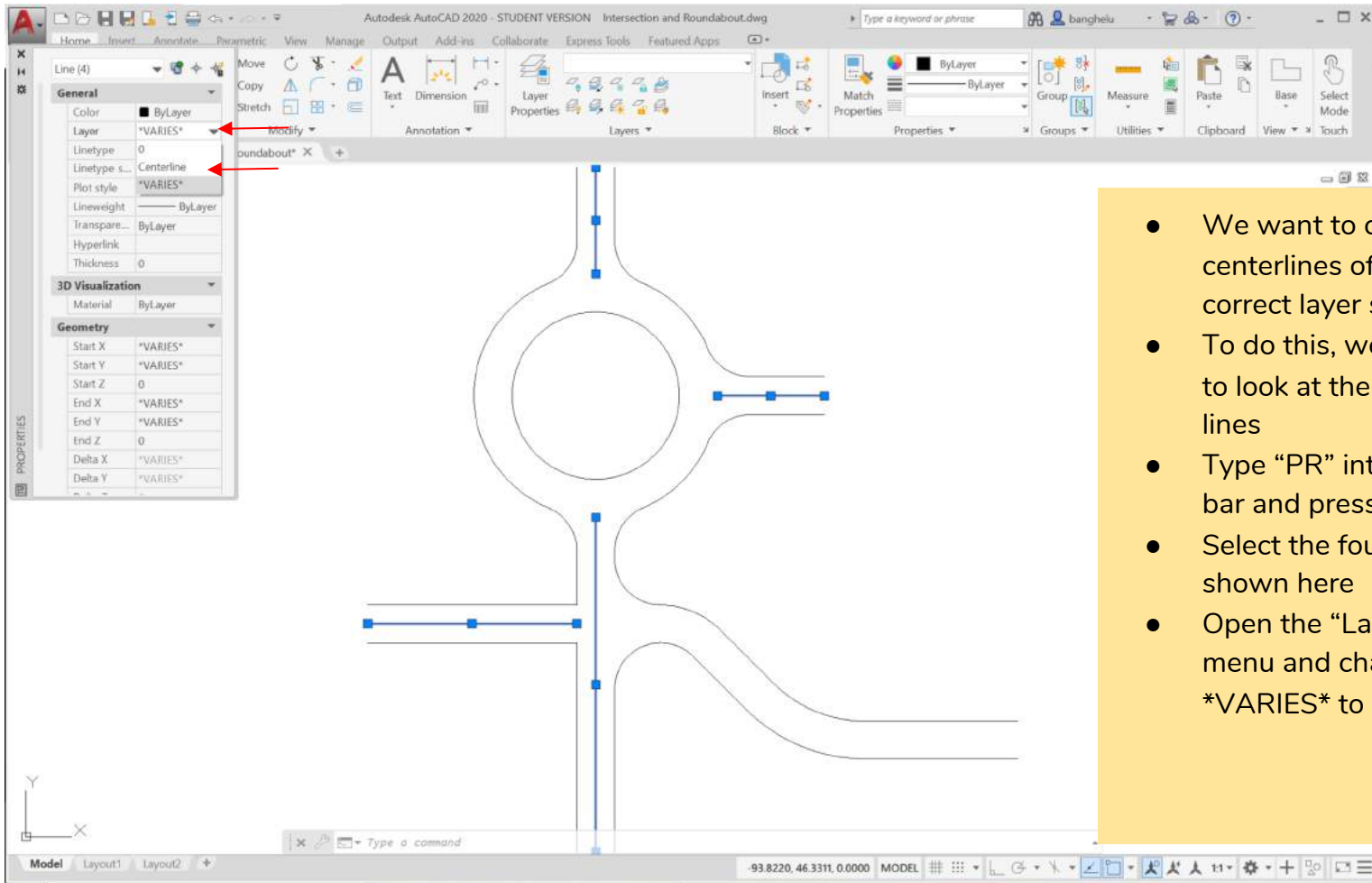


- Select the “ISO dash” linetype by clicking on “ACAD_ISO02W100”
- Click “OK”



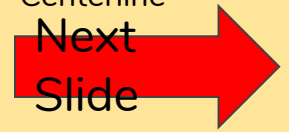


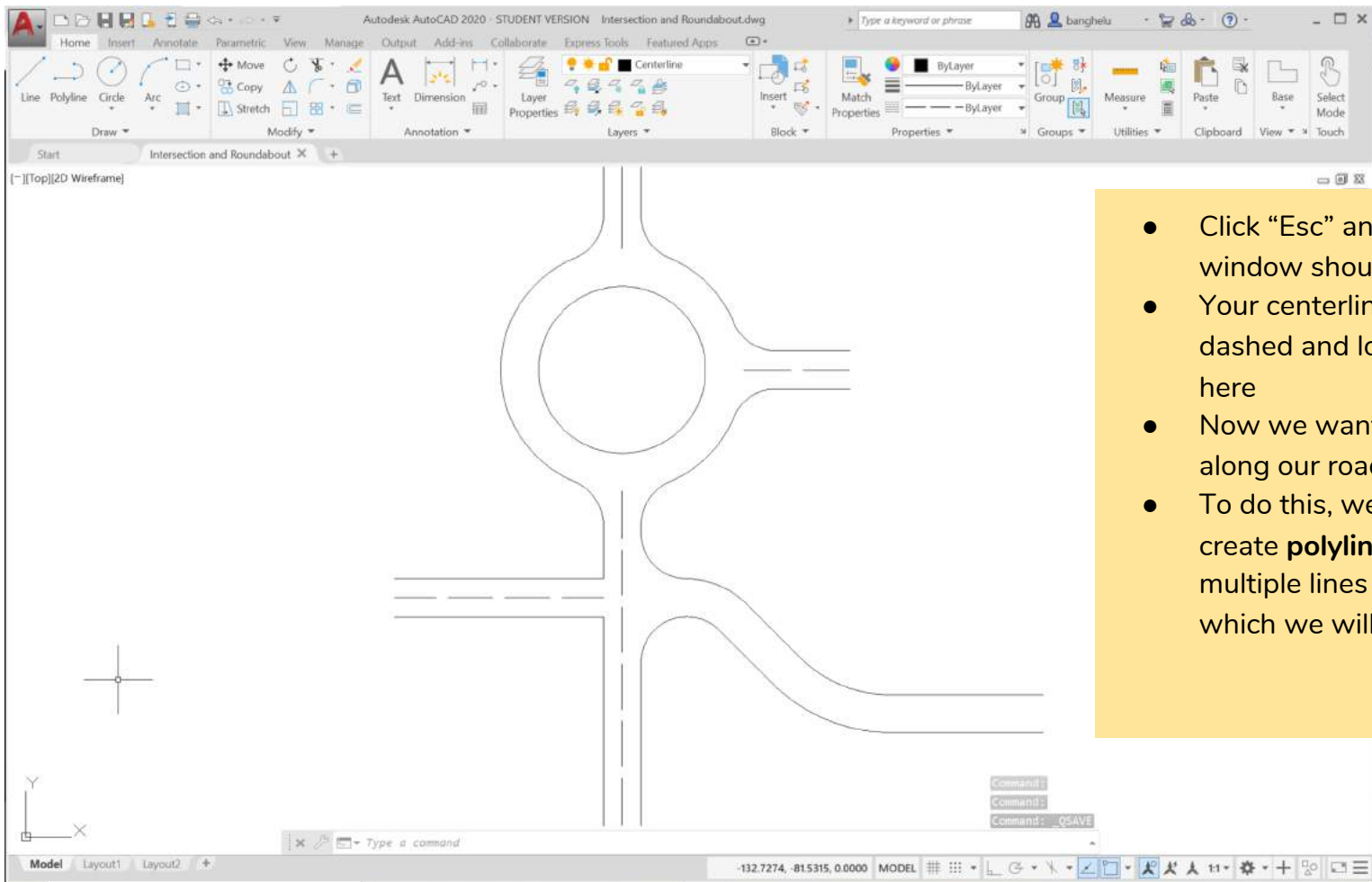
- Select “ISO dash” as your linetype by clicking on it
- Click “OK”
- All lines that you draw on the “Centerline” layer will now be dashed



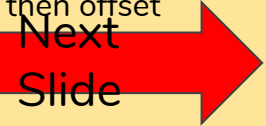
- We want to change the centerlines of our roads to the correct layer so they are dashed
- To do this, we are going to have to look at the **properties** of our lines
- Type “PR” into the command bar and press enter
- Select the four centerlines as shown here
- Open the “Layers” drop-down menu and change the layer from *VARIES* to “Centerline”

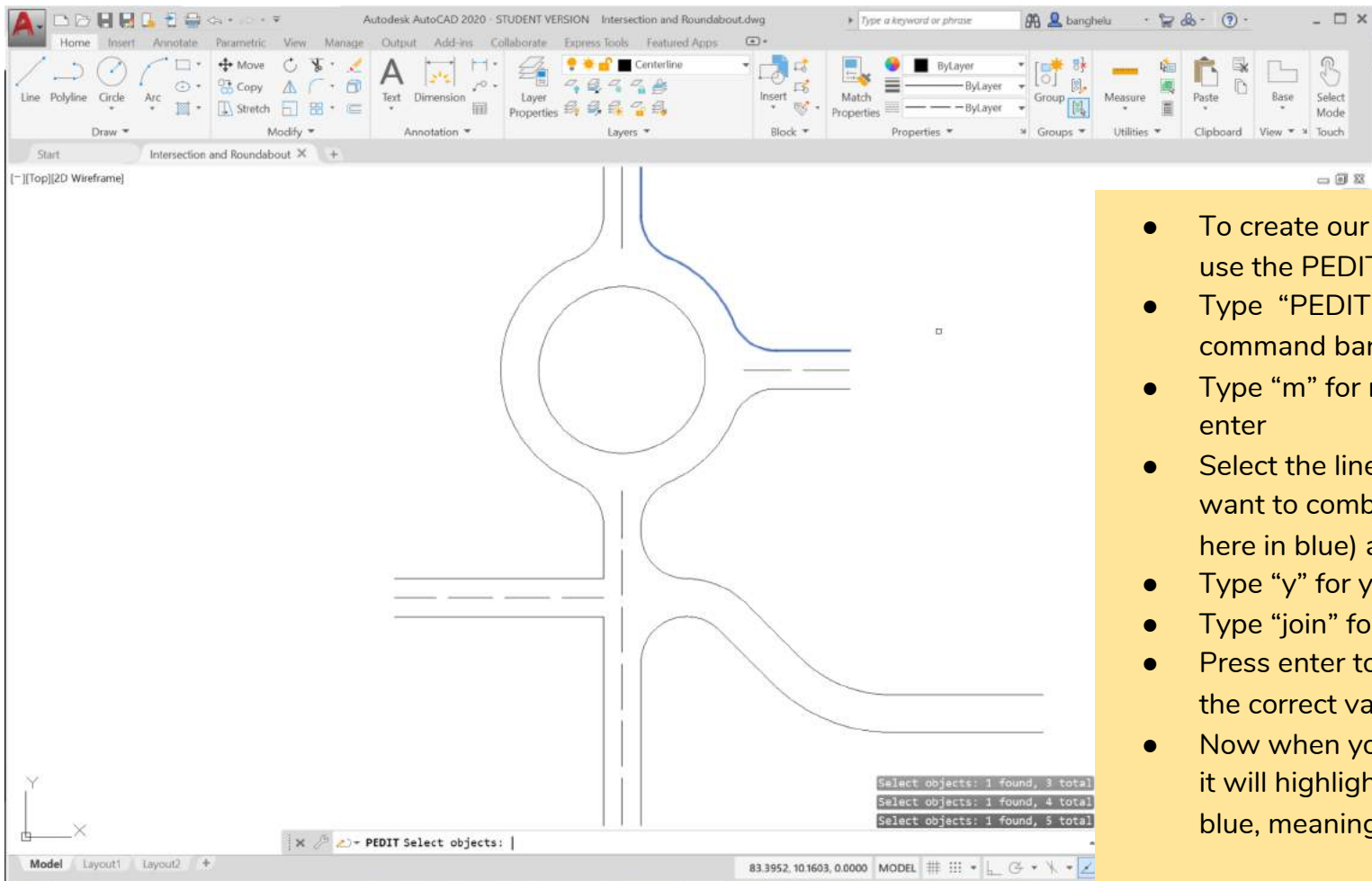
Next
Slide



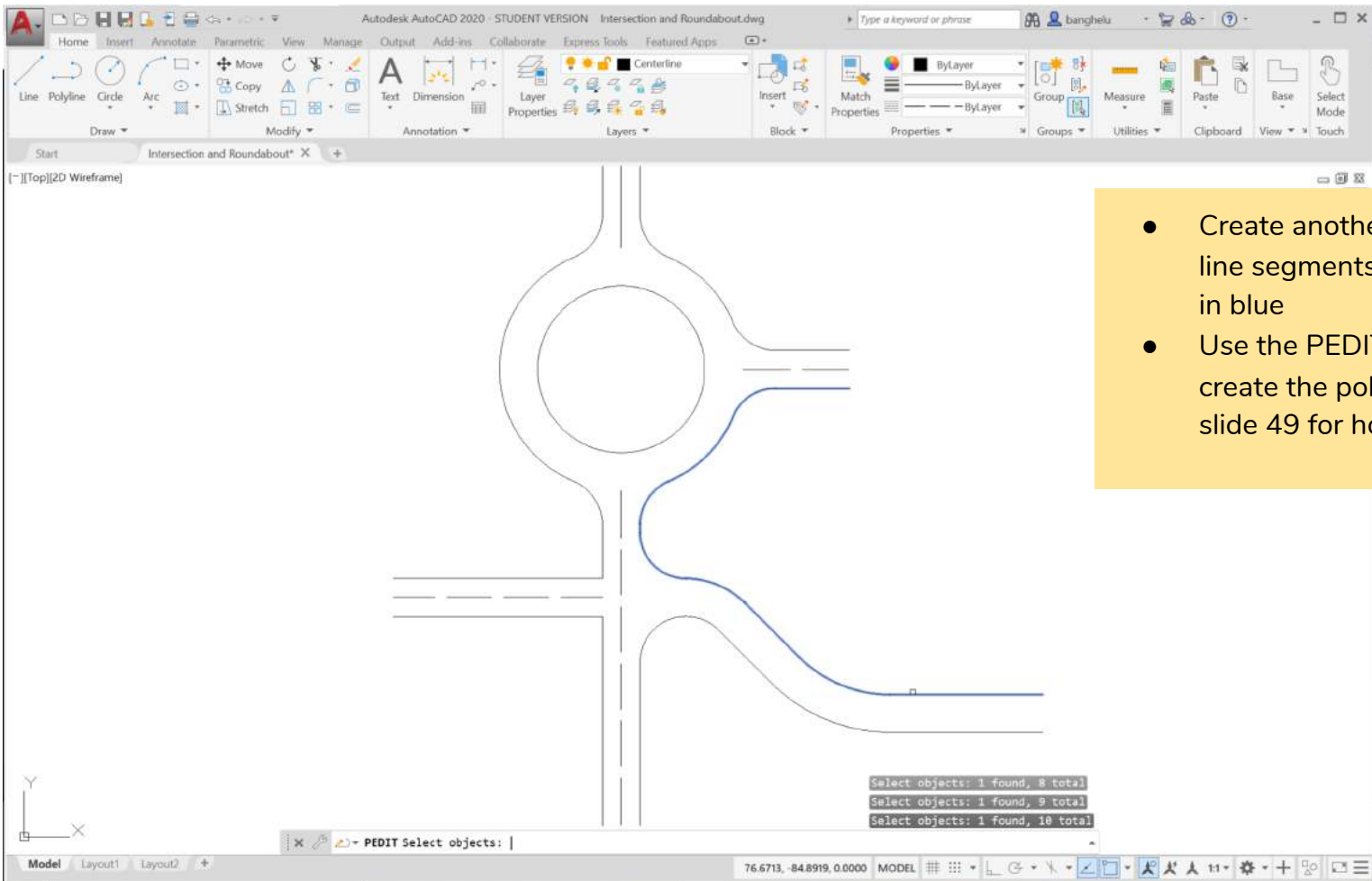


- Click “Esc” and the properties window should close
- Your centerlines should now be dashed and look like they do here
- Now we want to create curbs along our roads and roundabout
- To do this, we will have to create **polylines** (combine multiple lines into one solid line) which we will then offset

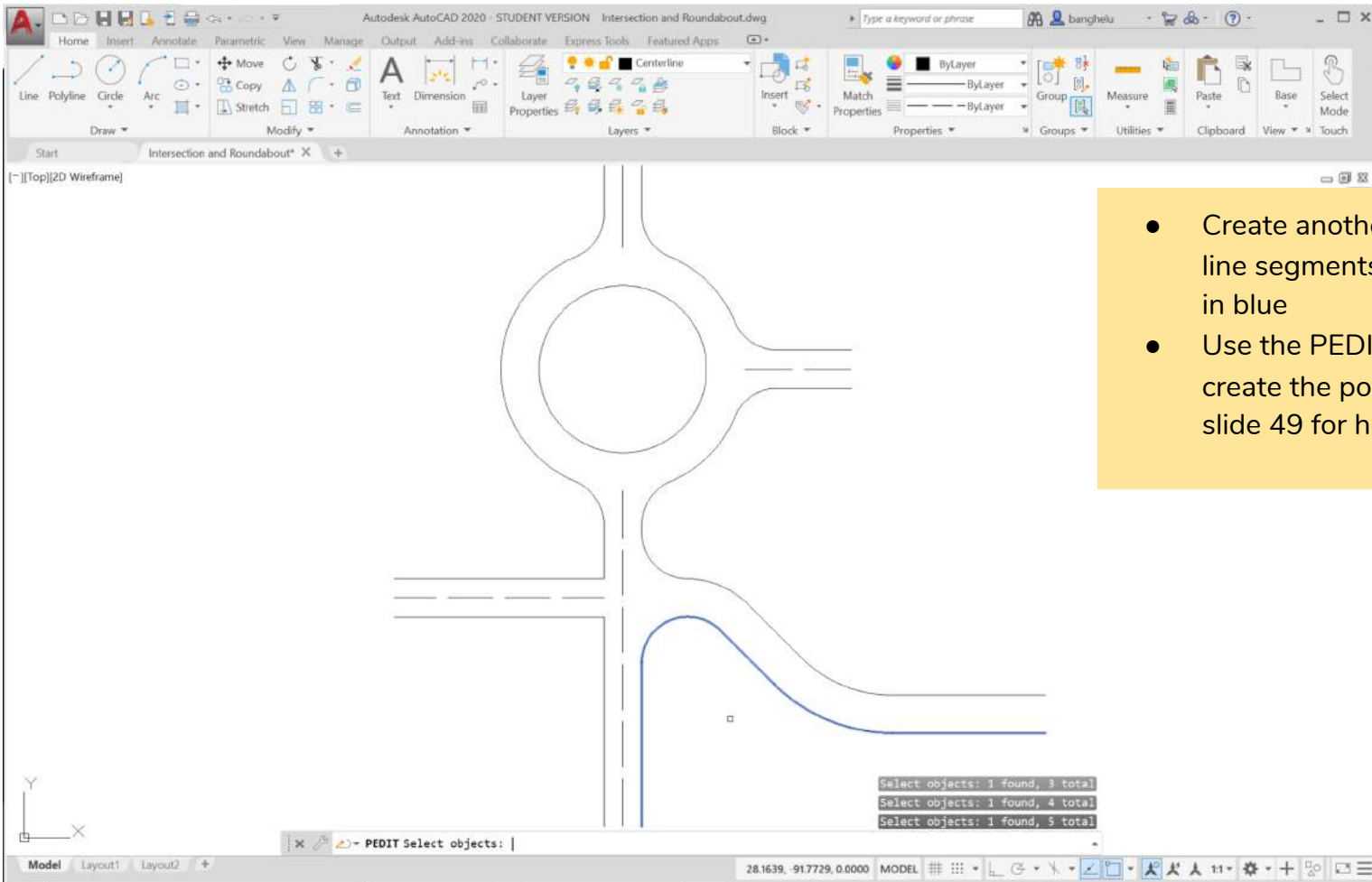
Next
Slide 



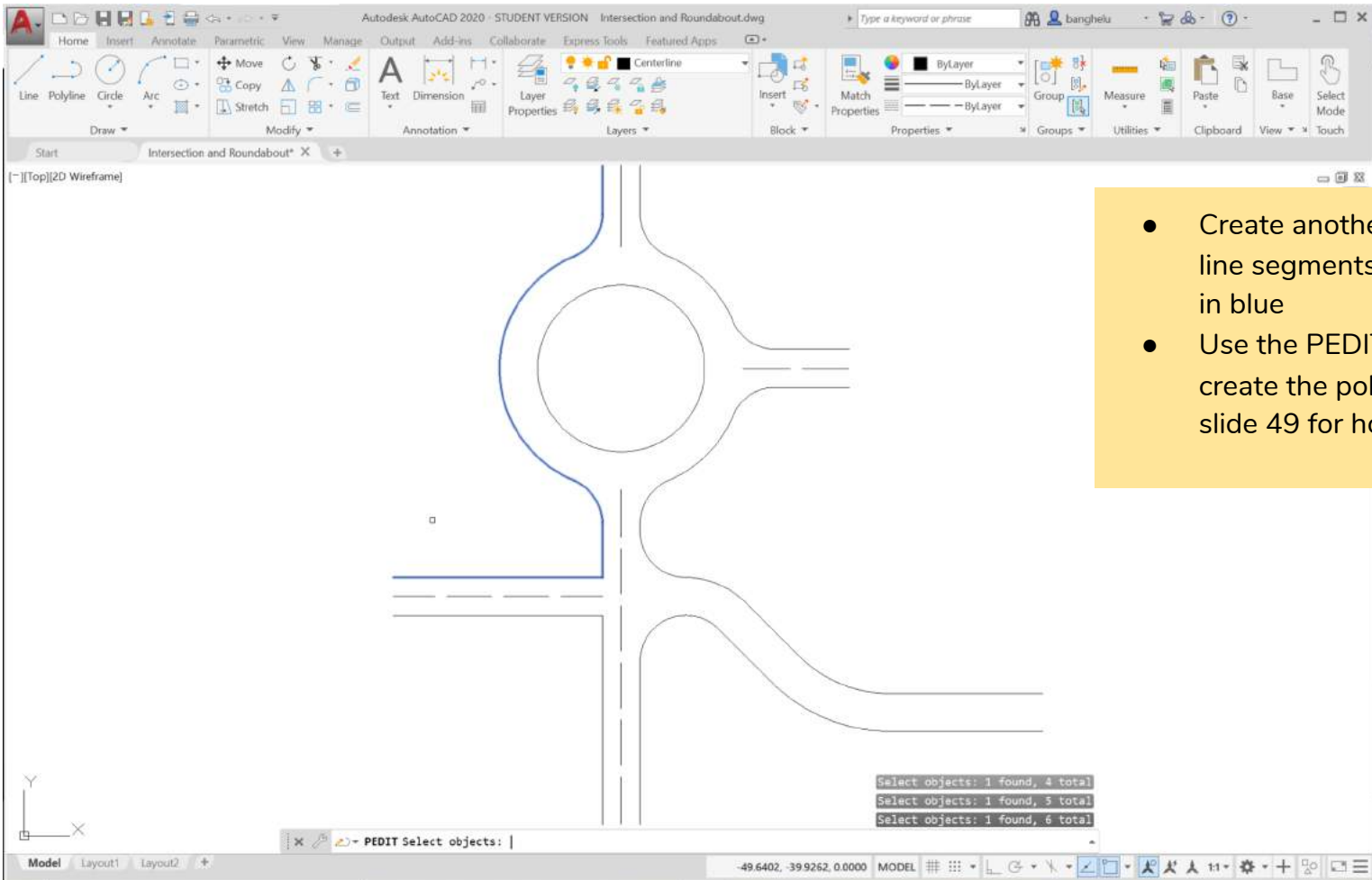
- To create our polylines we will use the PEDIT command
- Type “PEDIT” into the command bar and press enter
- Type “m” for multiple and press enter
- Select the line segments you want to combine (highlighted here in blue) and press enter
- Type “y” for yes and press enter
- Type “join” for enter
- Press enter to confirm zero is the correct value
- Now when you click on the line it will highlight the entire thing blue, meaning it is a polyline



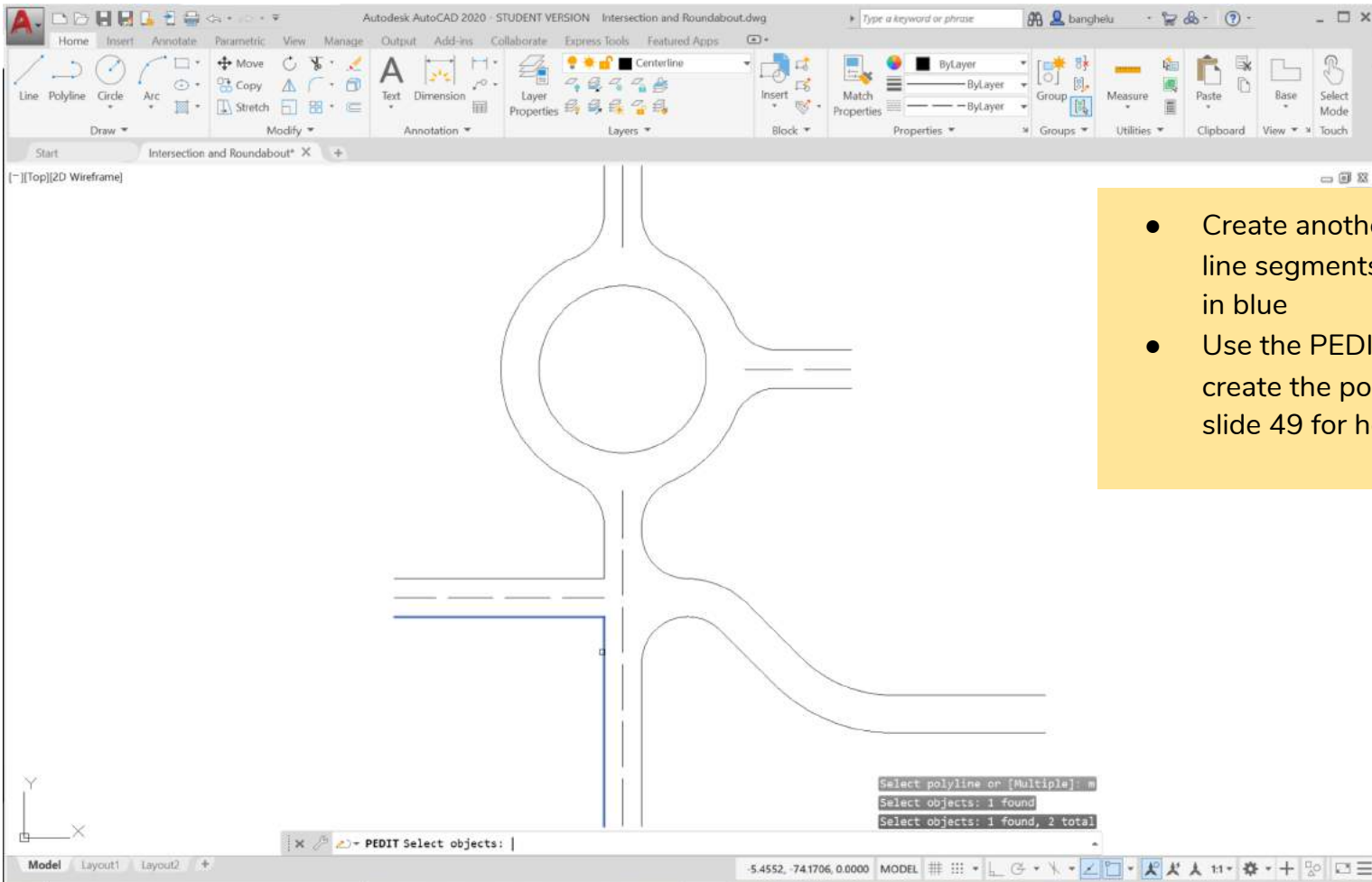
- Create another polyline for the line segments highlighted here in blue
- Use the PEDIT command to create the polyline, refer back to slide 49 for how to use PEDIT



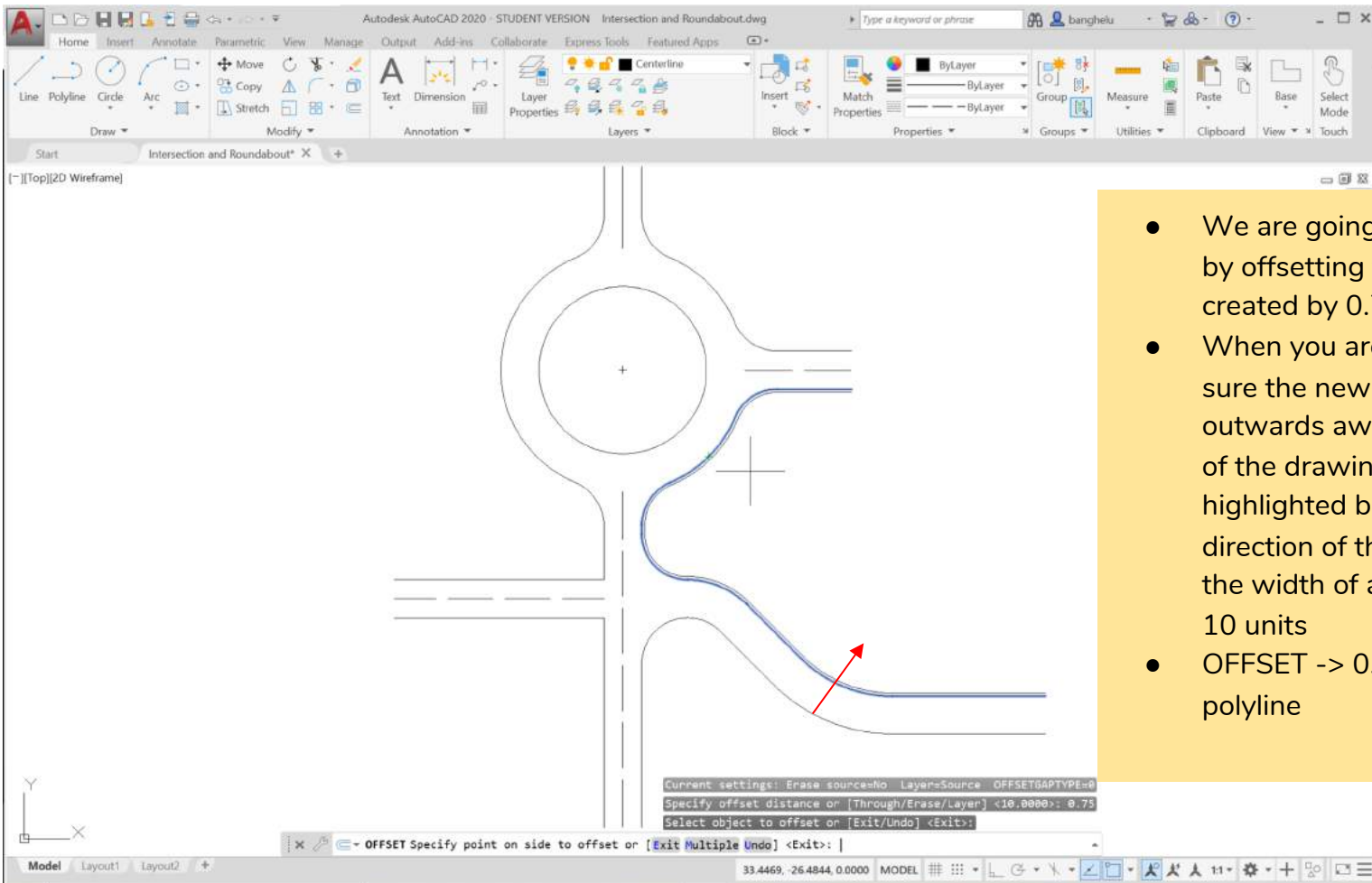
- Create another polyline for the line segments highlighted here in blue
- Use the PEDIT command to create the polyline, refer back to slide 49 for how to use PEDIT



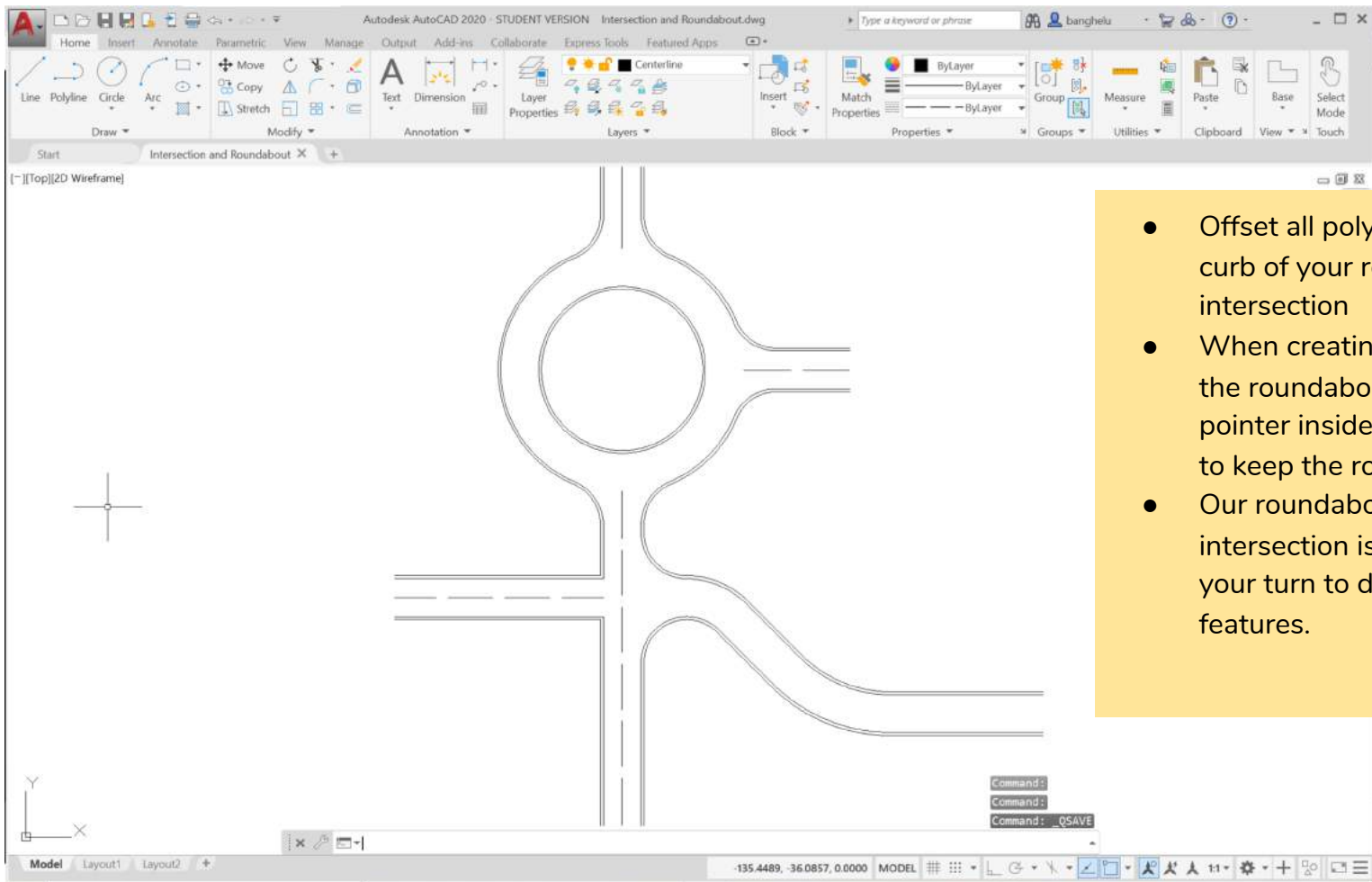
- Create another polyline for the line segments highlighted here in blue
- Use the PEDIT command to create the polyline, refer back to slide 49 for how to use PEDIT



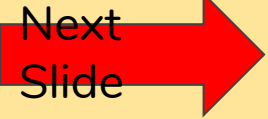
- Create another polyline for the line segments highlighted here in blue
- Use the PEDIT command to create the polyline, refer back to slide 49 for how to use PEDIT



- We are going to create the curb by offsetting the polylines we created by 0.75 units
- When you are offsetting, make sure the new line goes outwards away from the center of the drawing (for the polyline highlighted blue go in the direction of the arrow) so that the width of all roads remains 10 units
- OFFSET -> 0.75 -> select polyline



- Offset all polylines to create the curb of your roundabout and intersection
- When creating the curb inside the roundabout, move the pointer inside the smaller circle to keep the road width 10 units
- Our roundabout and intersection is complete! Now it your turn to design some safety features.



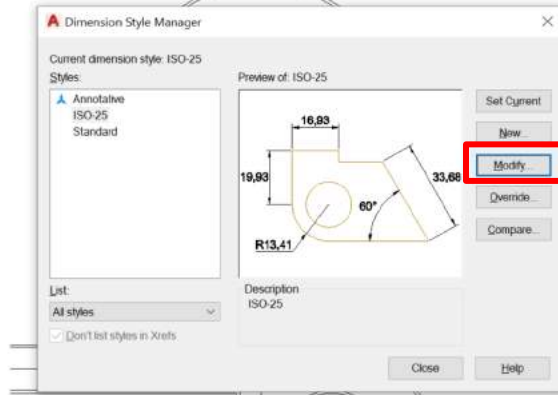
Thinking Like a Civil Engineer

- Now that we have our roundabout and intersection, it is time to start thinking about safety measures we have to take to protect pedestrians and cyclists
- Add bike lanes and crosswalks to your design, think about dimensions and locations for these features
- If you do not want your linework to be a polyline anymore (maybe you want to offset only sections of the linework instead of the whole polyline) use the command EXPLODE
- **Type “EXPLODE” into the command bar and press enter. Select the polyline you want to explode and press enter to confirm the selection.**

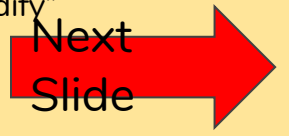


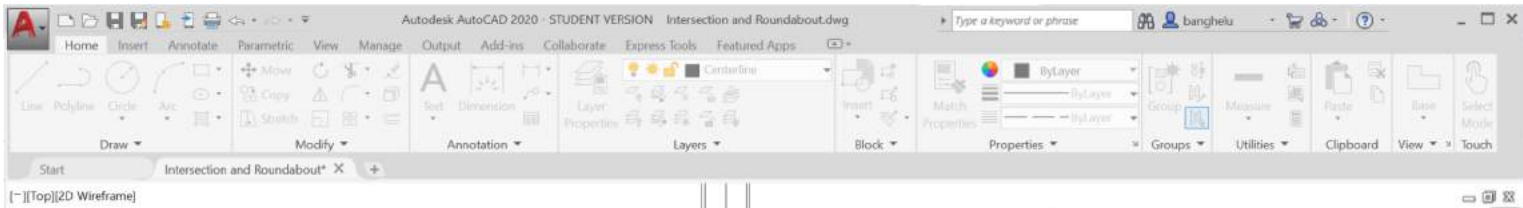


[~][Top][2D Wireframe]

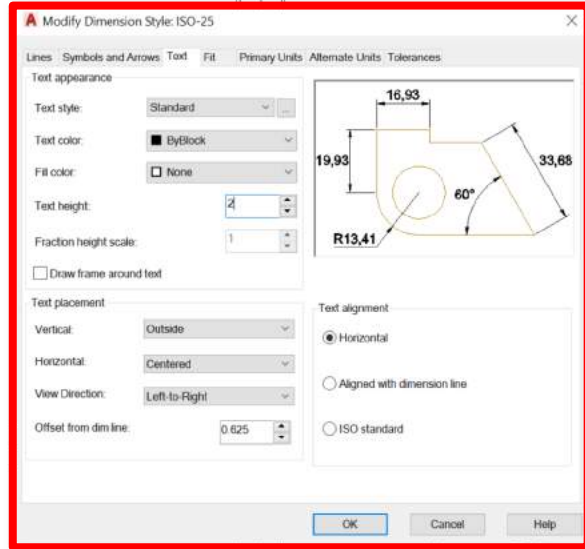


- Now that you have designed bike lanes and crosswalks for the roundabout and intersection, you can dimension the drawing (if you want to)
- First we have to change the dimension settings
- Type "DIMSTYLE" into the command bar and press enter
- The "Dimension Style Manager" will pop up
- Click on "Modify"





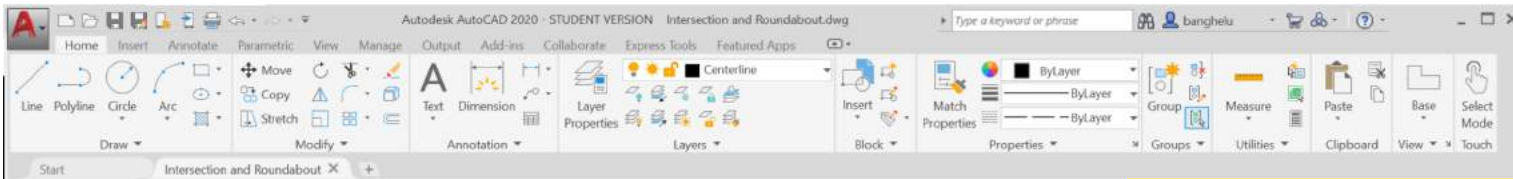
[Top]2D Wireframe



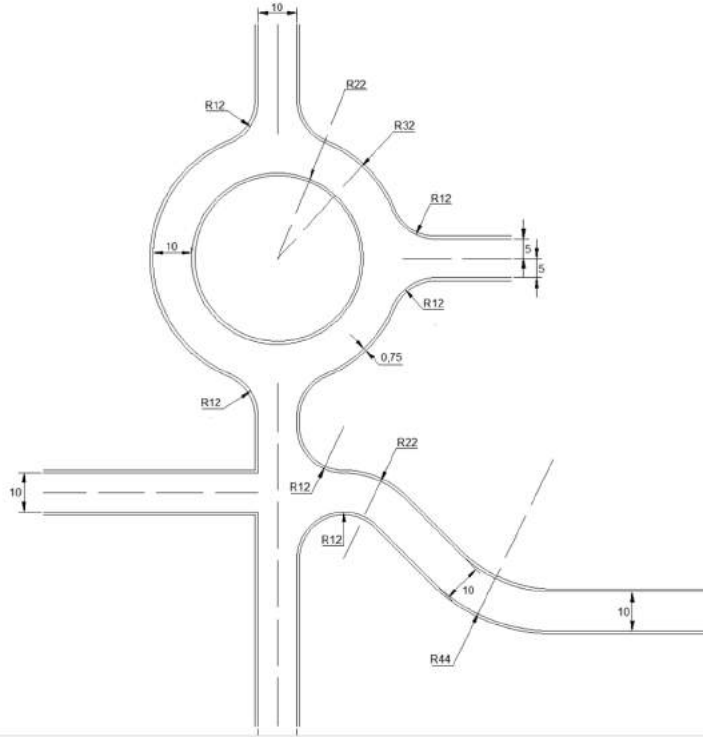
- Click on the "Text" tab
- Make sure your dimension style settings looks the same as ours here
- Click "OK" after you have made these changes



Type a command



[Top]2D Wireframe



- There are three dimensioning commands we can use:
- DIMLIN (create annotations that specify the linear distance between two objects, usually between two lines)
- DIMALI (create annotations that specify the distance (at an angle) between two objects. Often is used to show the distance between two curves)
- DIMRAD (create annotations that specify the radius of a circle, arc, or fillet)
- Type the command into the command bar and press enter, select the first line and then the second, your dimension will appear, for radii, just click on the circle or fillet

Model Layout1 Layout2

-83.1732, -96.0266, 0.0000 MODEL

Tutorial Complete!

- Great job, you just drew an intersection and roundabout using AutoCAD and designed your own bike lanes and crosswalks!

