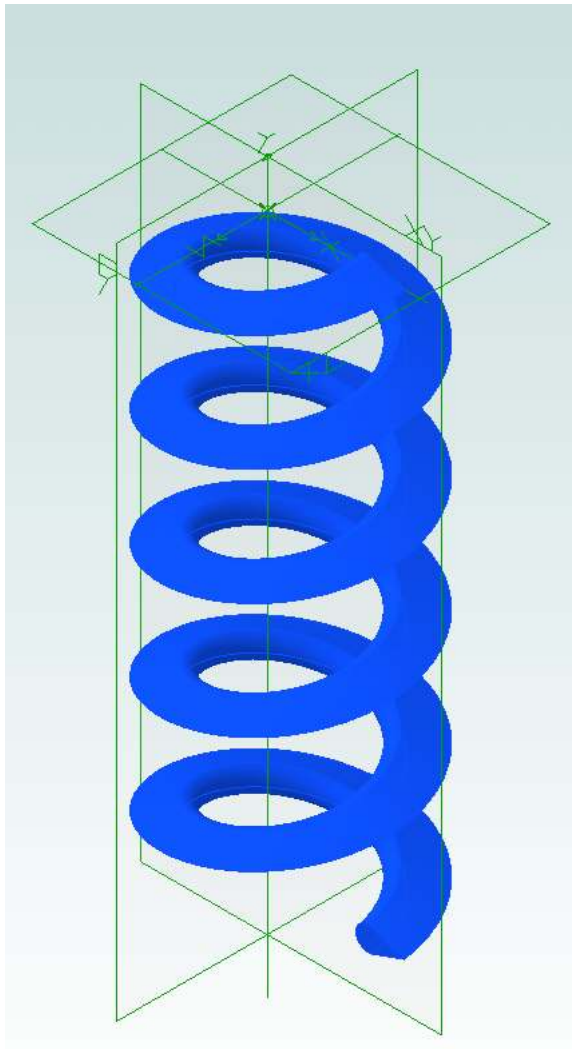


# The Helical Boss and Helical Cut

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By **R. G. Sparber**

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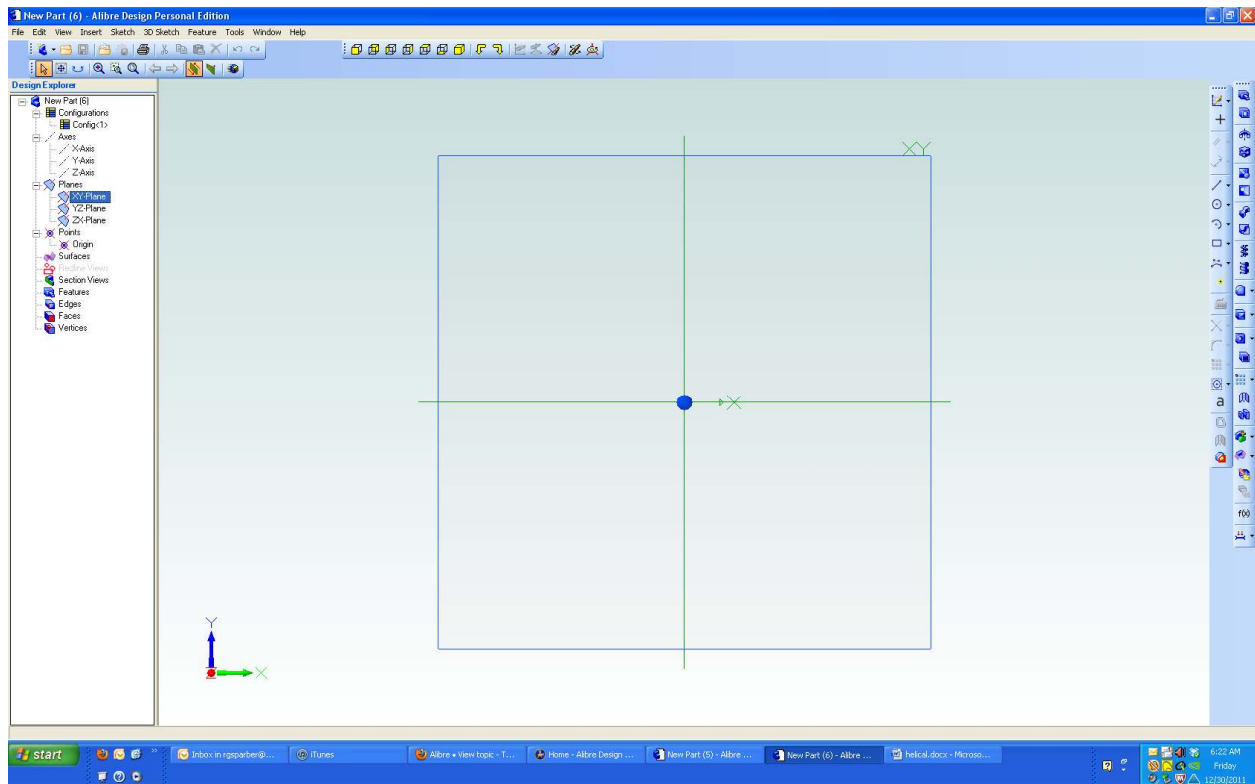
Alibre® CAD is helping me think better in 3D but I've still got a long way to go. One feature that has confused me for a long time is the helical boss and its inverse, the helical cut.

This helix starts on the XY plane and coils around a reference line parallel to the X axis. I find it very hard to see these details in this picture. Other views may help and will be given in this article.

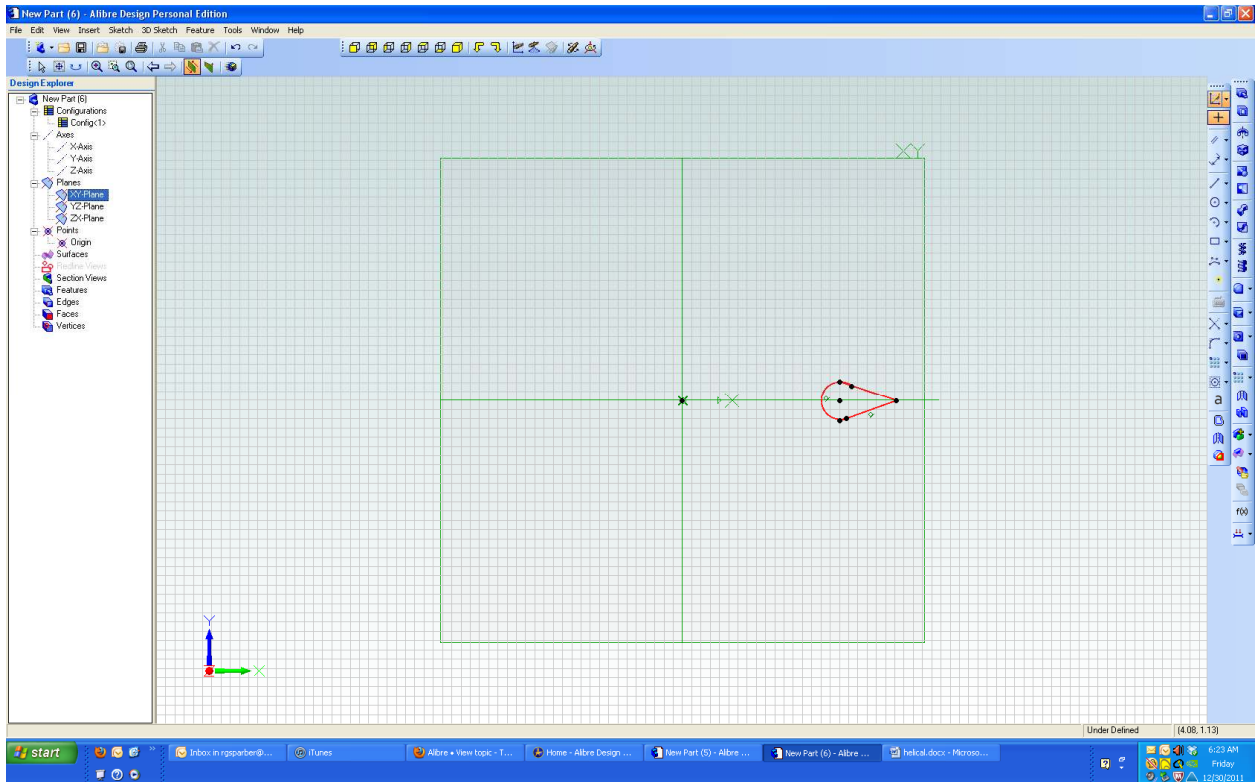
Let's draw a helical boss and see the evolution.

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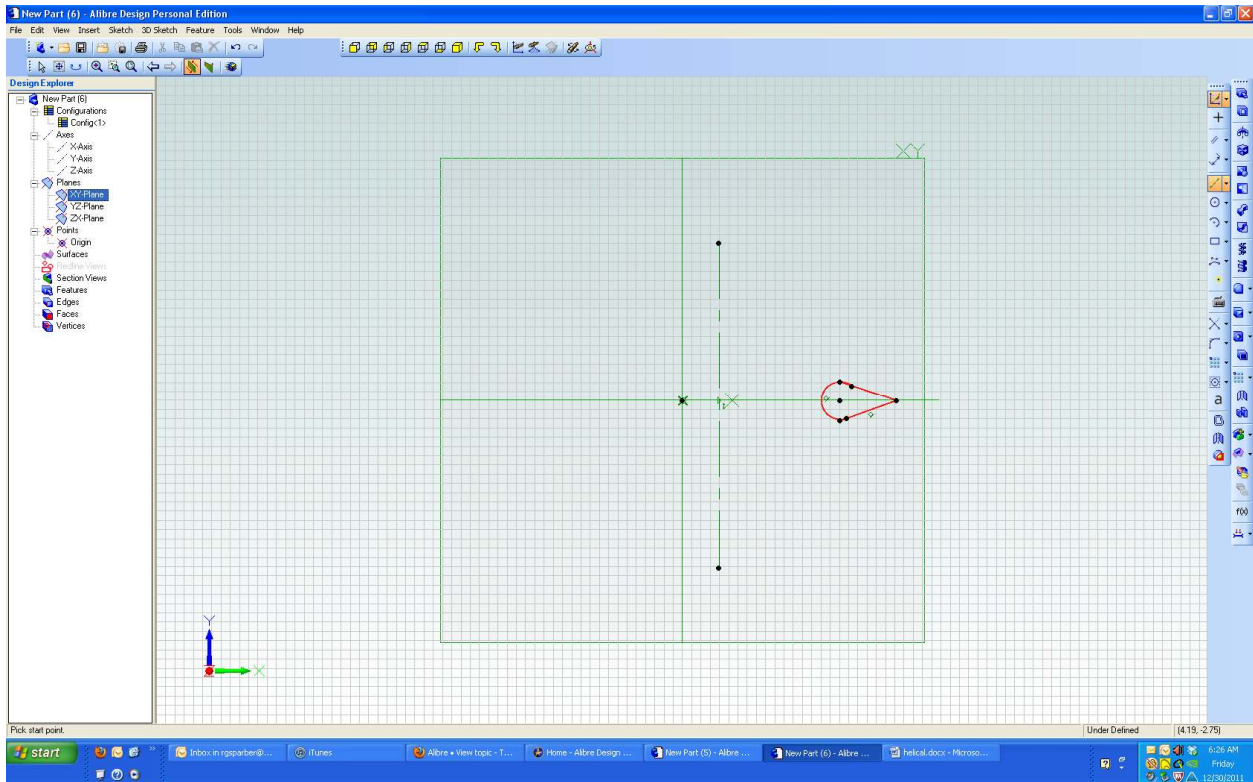
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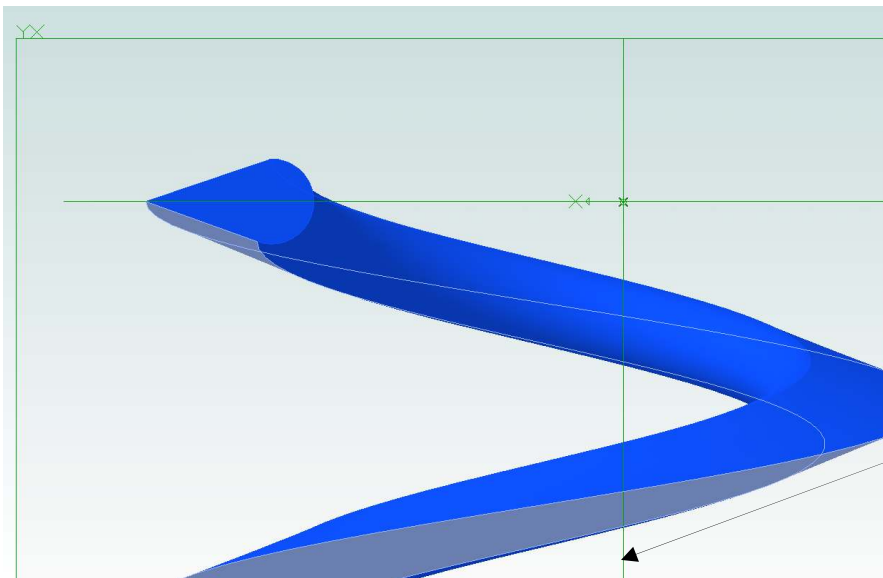
I started with my 2D sketch tool and selected the XY plane.



I drew this arbitrary 2D shape from a circle and two tangent lines. Excess lines were removed with the line cut tool.

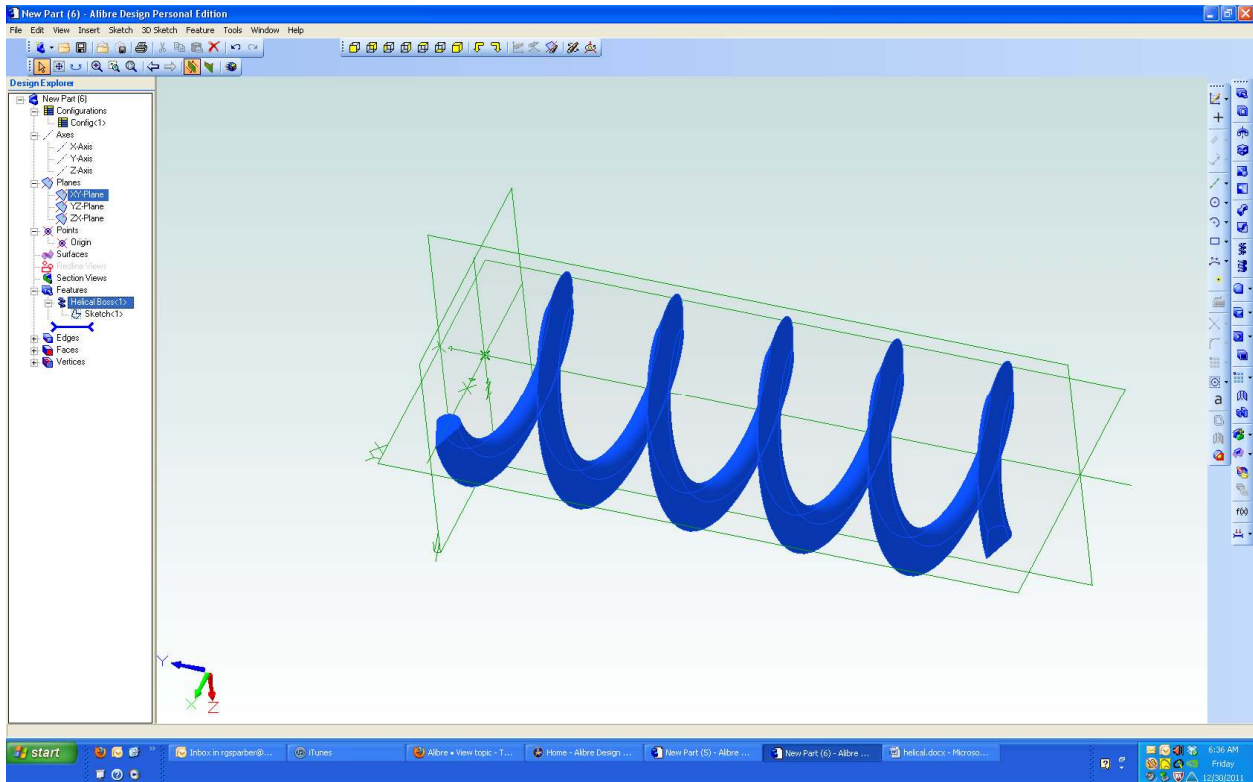


Next, I drew a vertical reference line. This line will be the central axis of the helix. My cross section will wind around this reference line.



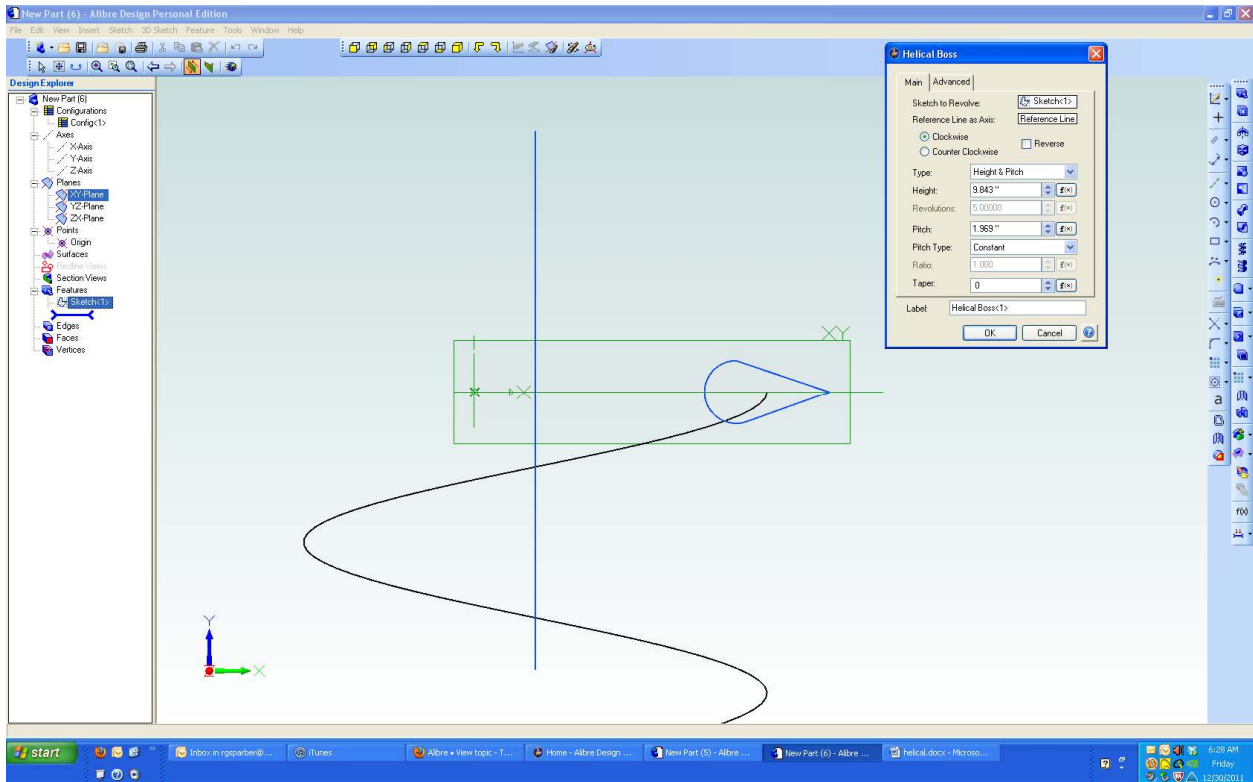
This is the finished helix. We are looking at the back side of the XY plane. Our cross section is resting on this plane and the 3D helix is rising from it, away from us.

Our major axis is the green vertical line.



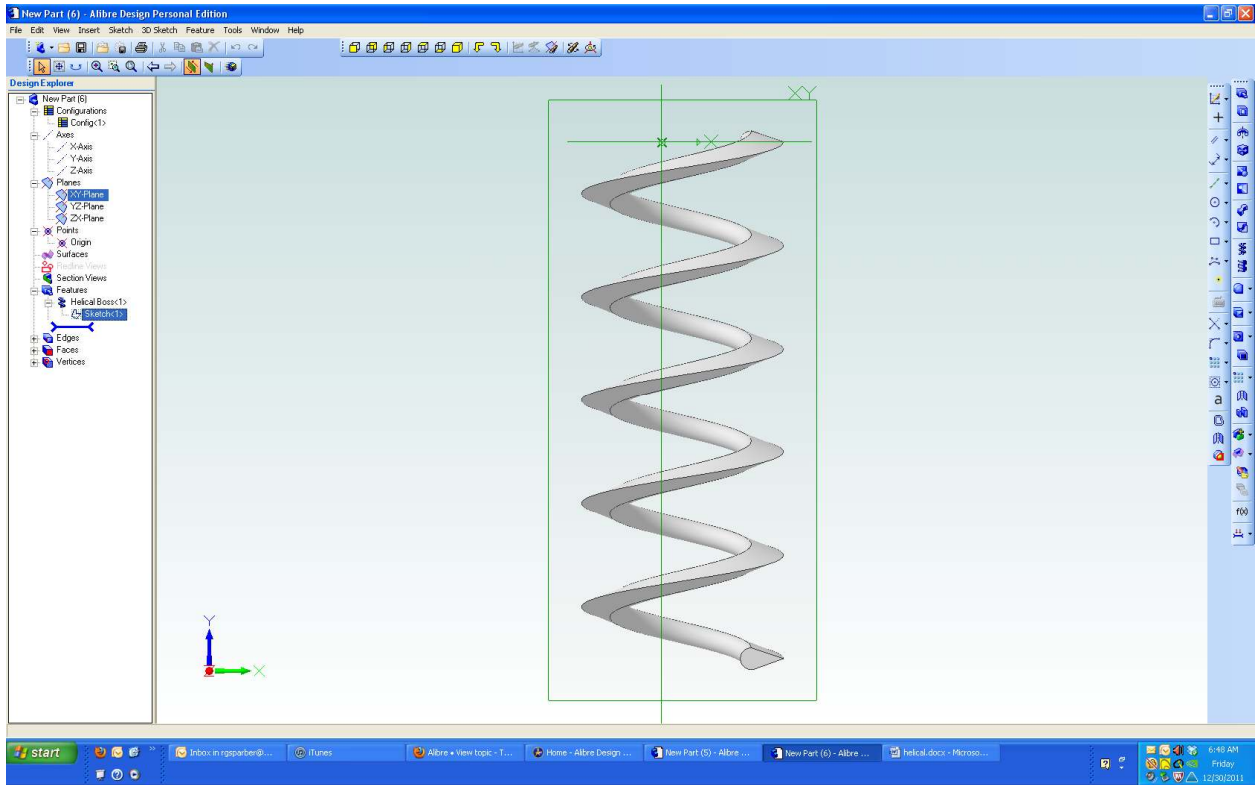
Here is another view of the helix which shows the cross section and the major axis. The bit that confused me was that you draw the cross section and the major axis on the same plane.

This 3D image helps explain why this works. My helix is starting from the plane and rising away from it. The major axis defines the center of revolution of the cross section.



When I bring up the Helical boss tool, it sees only the 2D closed figure and a single reference line. The tool is smart enough to know that the closed figure must be the cross section of the helix and that the reference line must be the major axis.

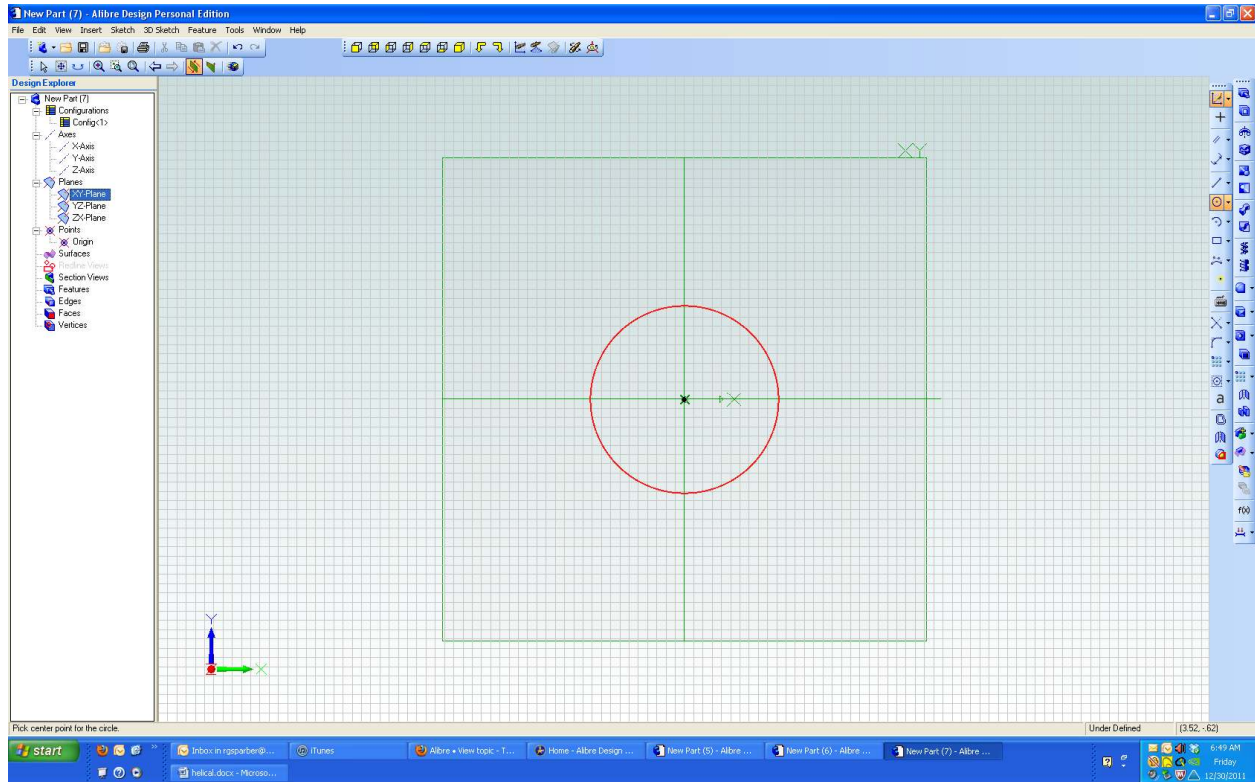
If there were many 2D closed figures and/or reference lines, you would have to select which ones to use.



When I click OK, I get my helix. There are many options for forming the helix but I won't address them here. My goal was to just make a helix and have it make sense.

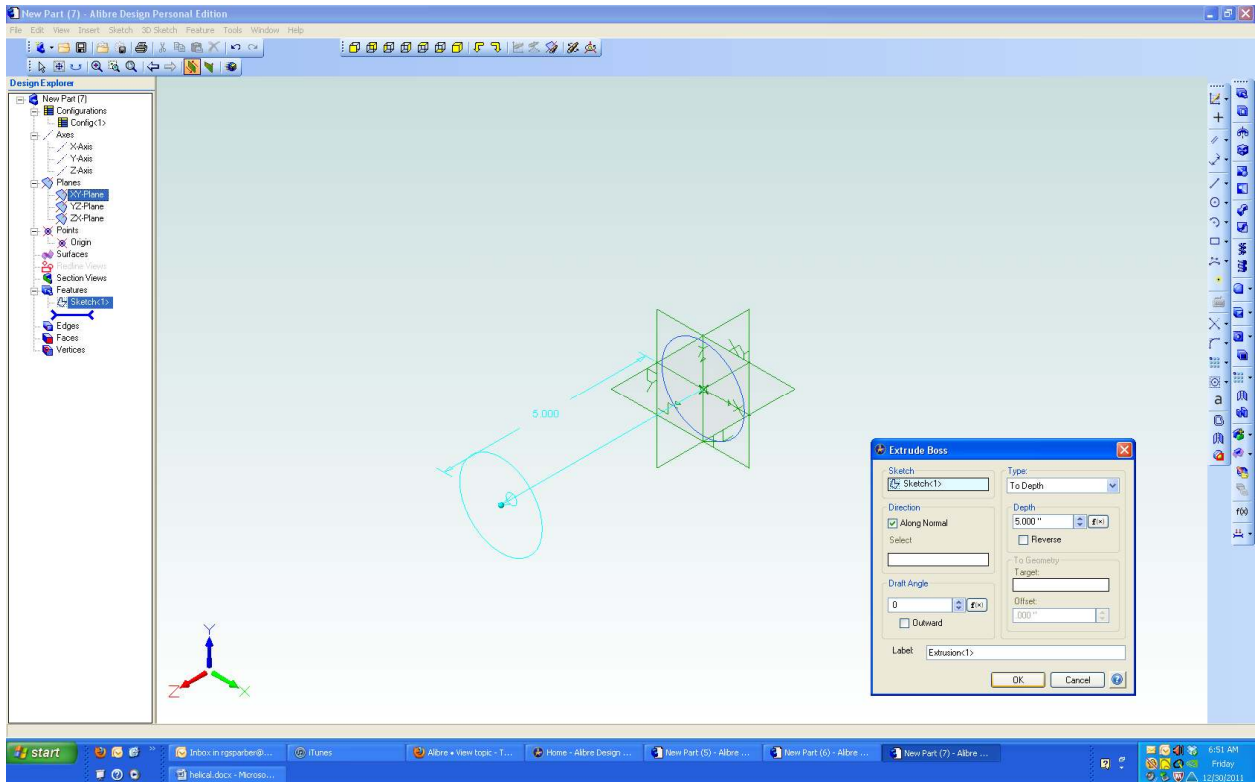


Next I will draw a helical cut.

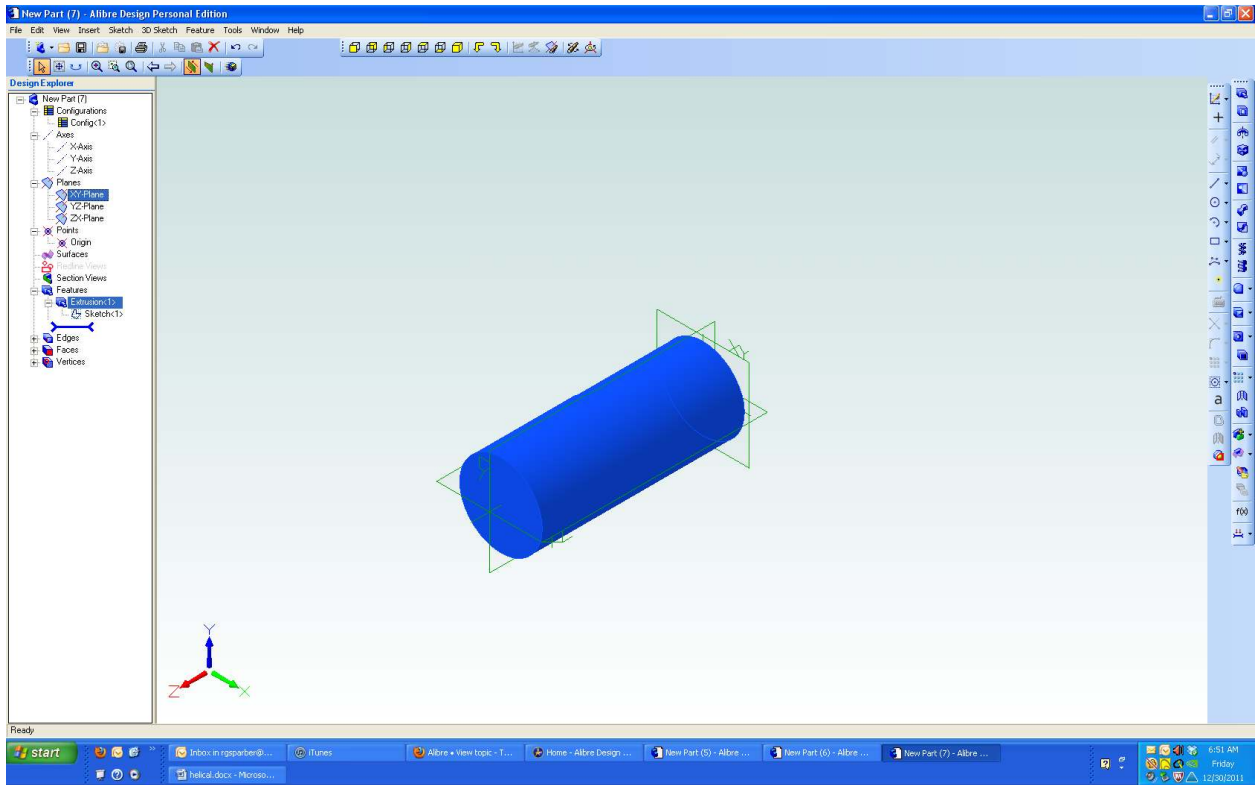


I need something to cut so will form a cylinder. This requires me to select the 2D sketch tool and a plane. Then I drew a circle.

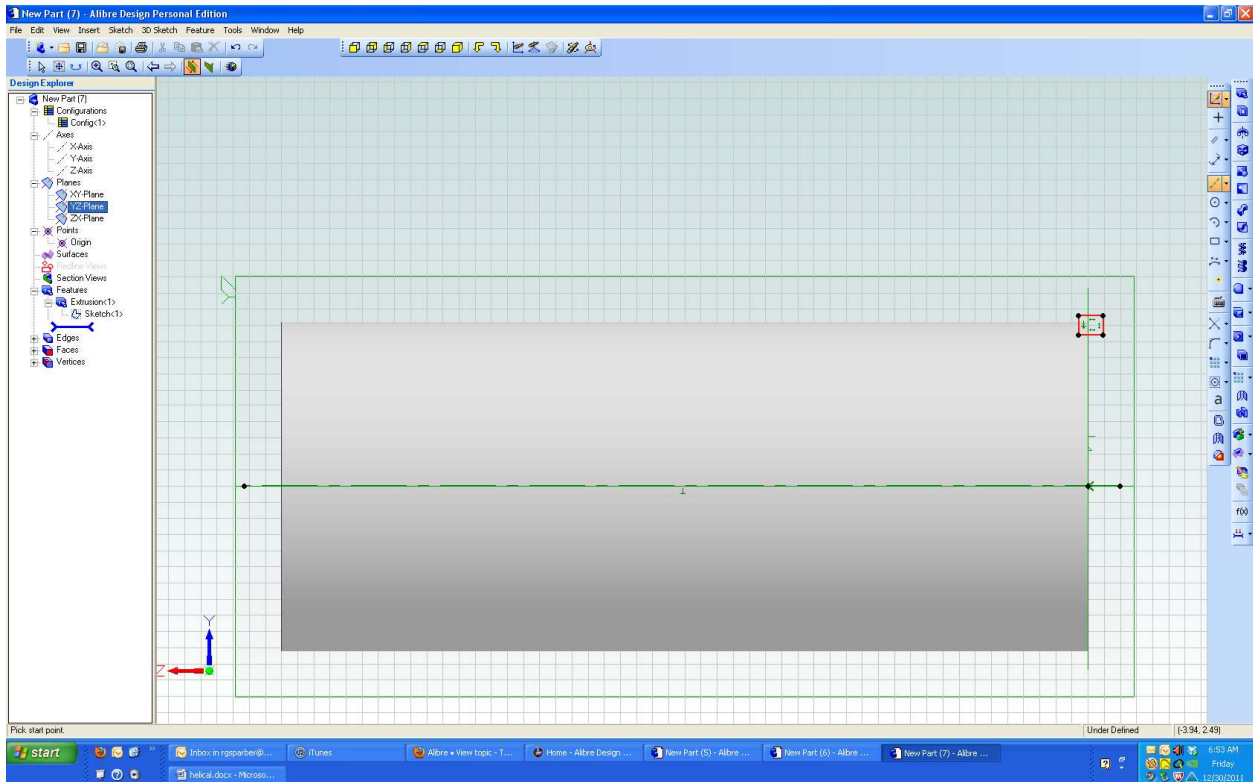




I've called up the Extrude boss tool and will use the default length of 5''.

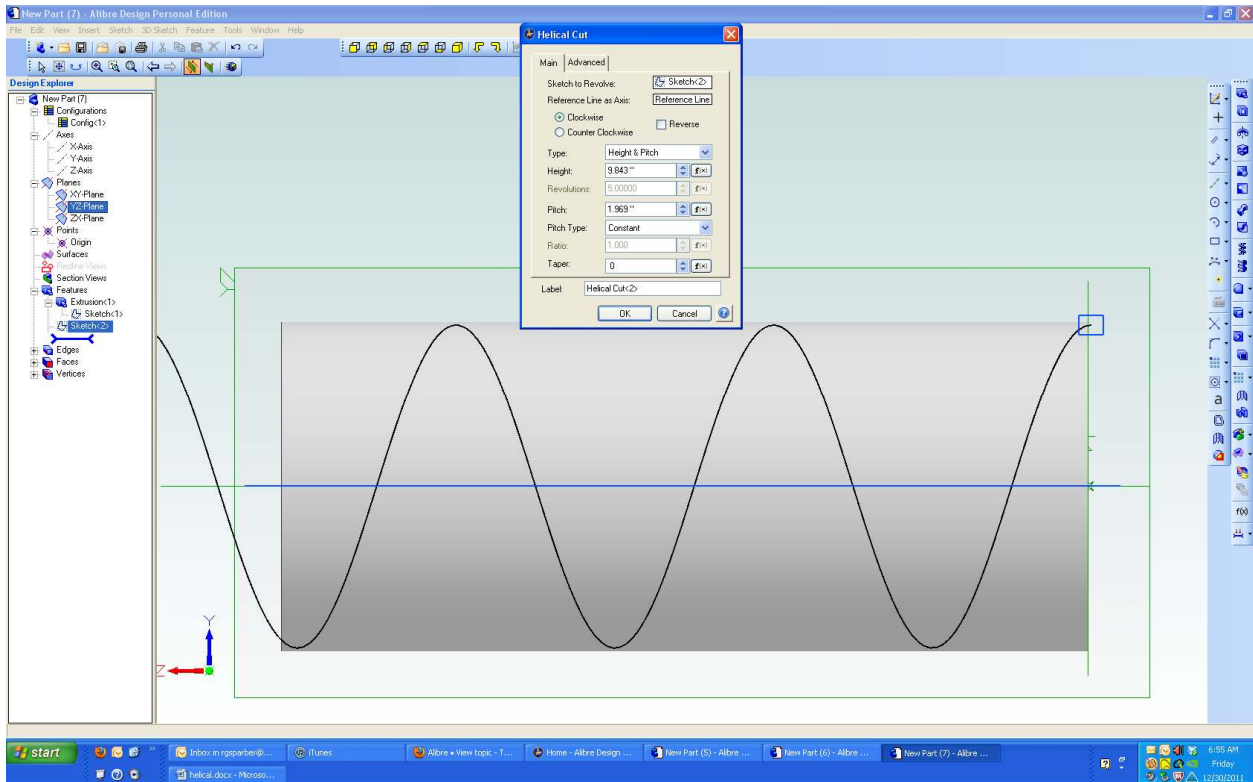


So now I have my cylinder to cut up.

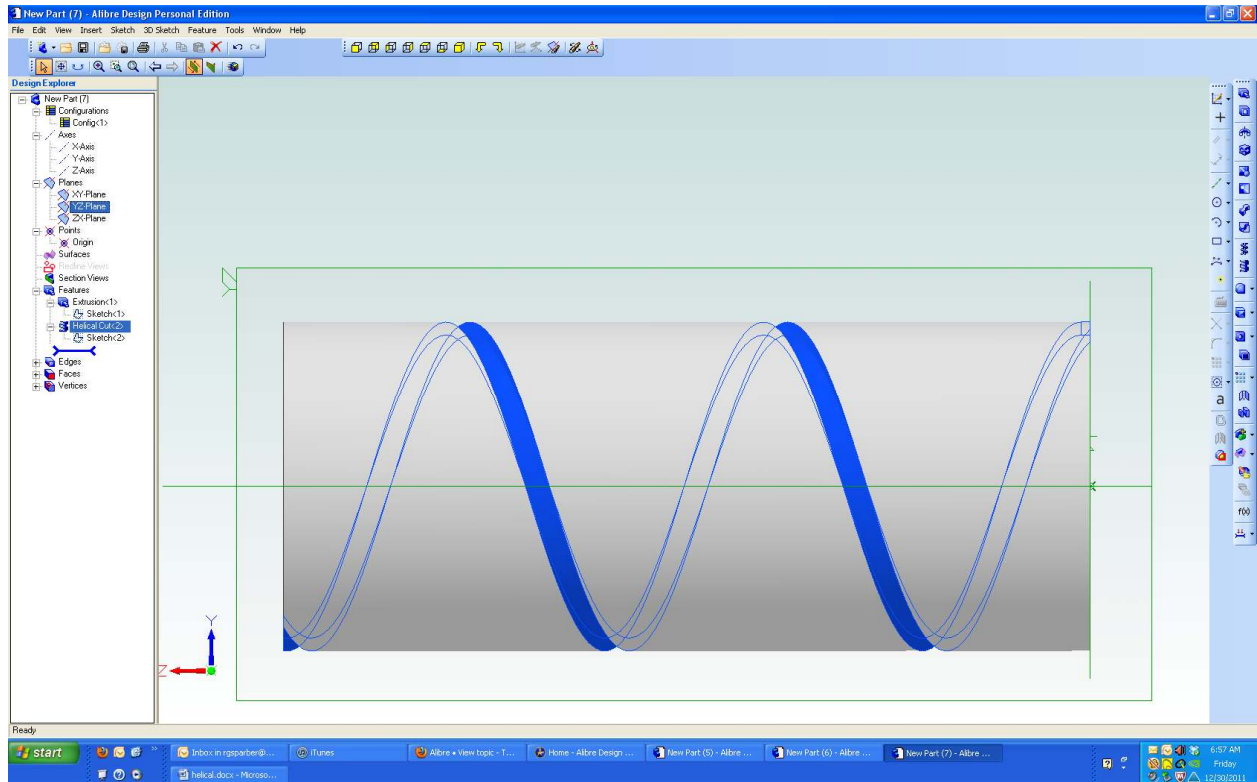


I have again called up my 2D sketch tool but this time selected my YZ plane. I want to wrap the cut around the Z axis so need the YZ plane. I could also have used the XZ plane. The key is to select a plane that give access to the major axis.

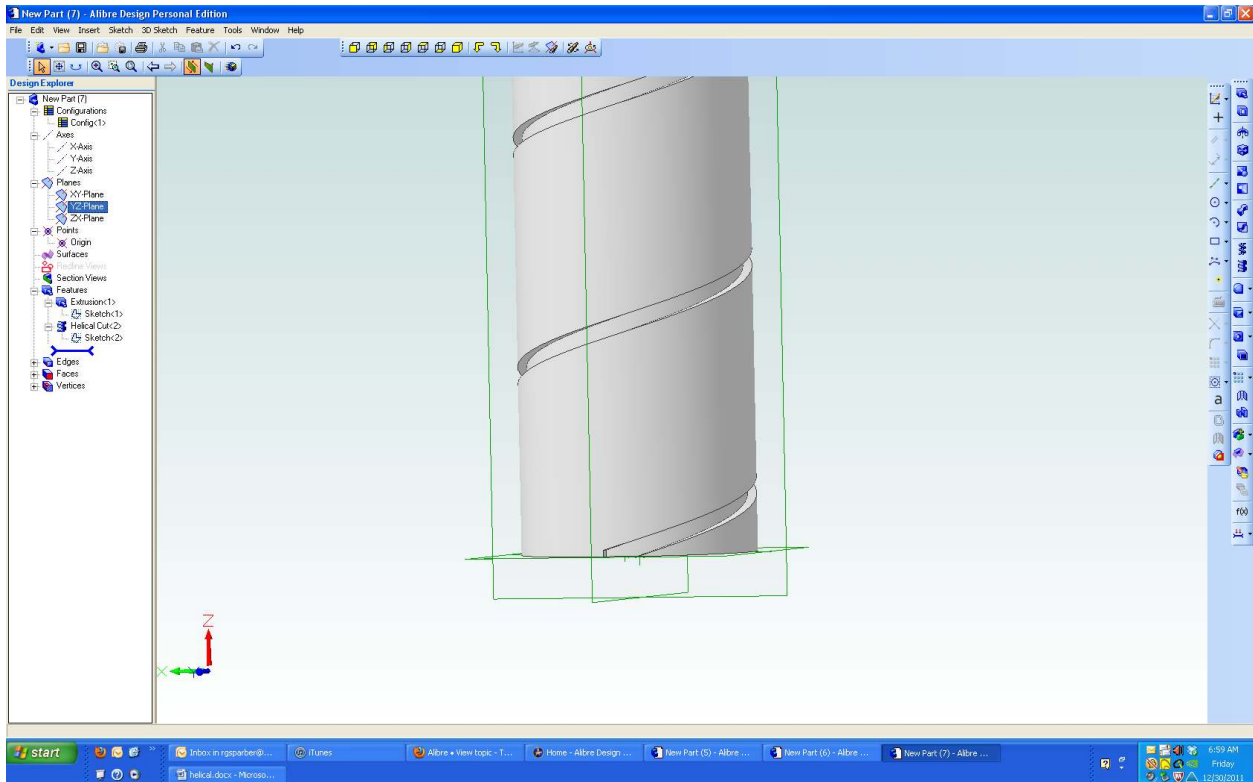
I drew a box that overlaps the upper right corner of the cylinder in this view. This will be the starting point of the helical cut. I have also drawn a reference line along the Z axis. This line will be the center of rotation of my cut.



When I called up my Helical cut tool, it saw only the 2D closed figure and my reference line. So, like the Helical boss tool, it knew that these were the elements I wanted to use to form my cut. I have just accepted all default values.



When I click OK, I get my helical cut. The cut is in blue because it is still selected.



Here you see the helical cut starting on the XY plane and rising up. Because my 2D sketch extended beyond the outline of the cylinder, I get an open cut. If it was entirely inside the outline, I would get a helical tunnel.

The key thing to remember is that the cross section is rising or falling from the plane it was drawn on. As it moves to trace out a helix, it needs the reference line to know what to circle.

I welcome your comments and questions.

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