Helix Spring

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Starting a command

Rhino has a very flexible and customizable interface. You can start commands three different ways depending on how you like to work.

You can:

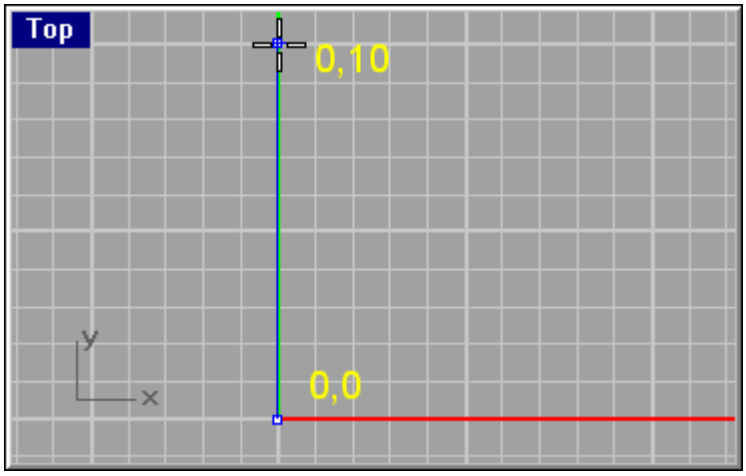
- Use the pull-down menu.
- Click a toolbar button
- Type a command at the command prompt

Click the command name to popup a chart that shows the button, the command name and the menu location. Soon you will find a method that suits your style.

Use the method you like best to activate the command.

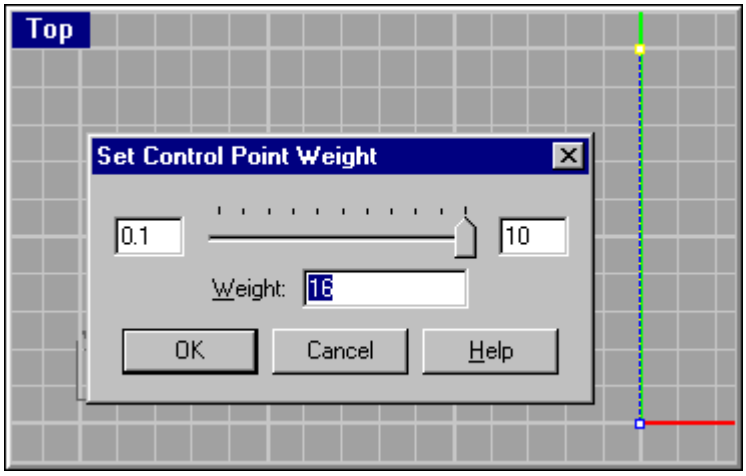
Draw a line

- In the **Top** viewport, use the Line command to create a line from **0,0** to **0,10** like image below.



Set weights for the control points

1. Press F10 to turn on the line's control points
2. Use the Weight command to set weight of control point at 0,10 to **16**.

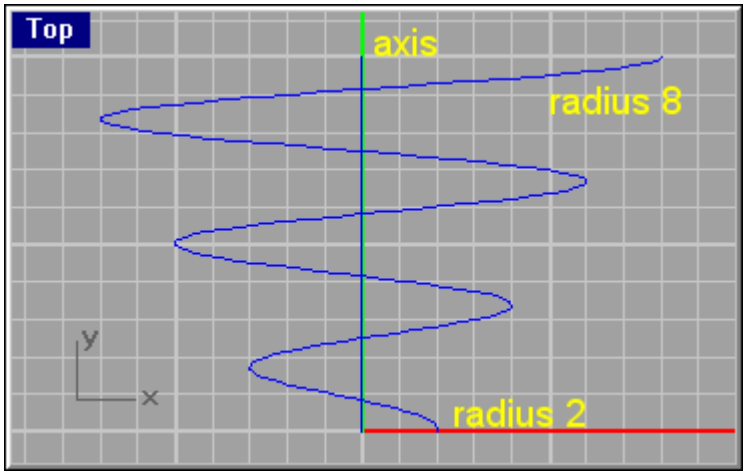


Draw a spiral

1. Use the Spiral command to create a spiral.

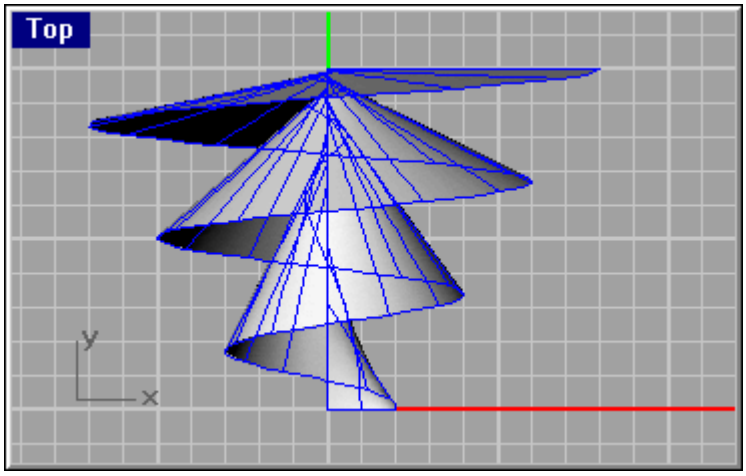
   The axis is the same as the line you drew in the first step.

2. Set the first radius to **2**.
3. Set the second radius to **8**.
4. Set the number of turns to **3**.

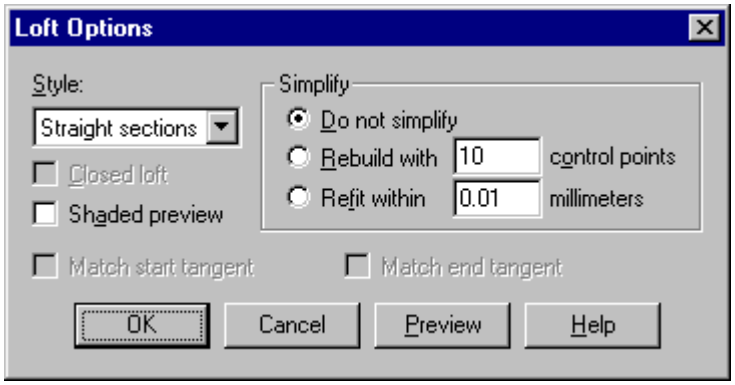


Loft the spiral

1. Use the Loft command using the line and the spiral to create a surface like image below.



2. From the **Style** list, choose **Straight sections**.

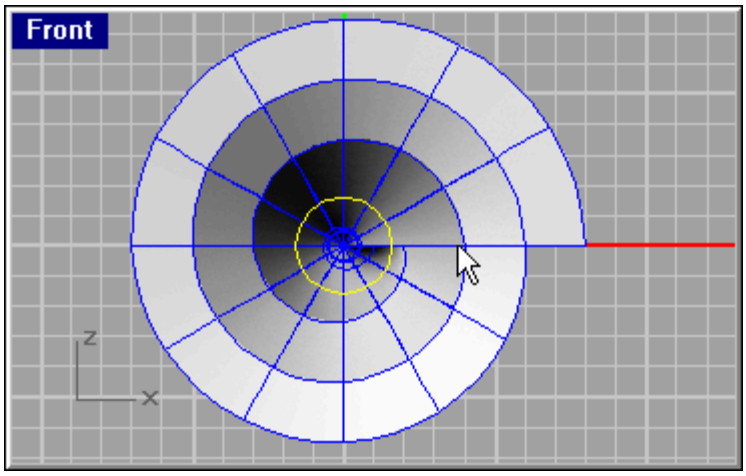


Draw a circle

1. In the **Front** viewport, draw a Circle

2. Use the **End** object snap to snap to the line.

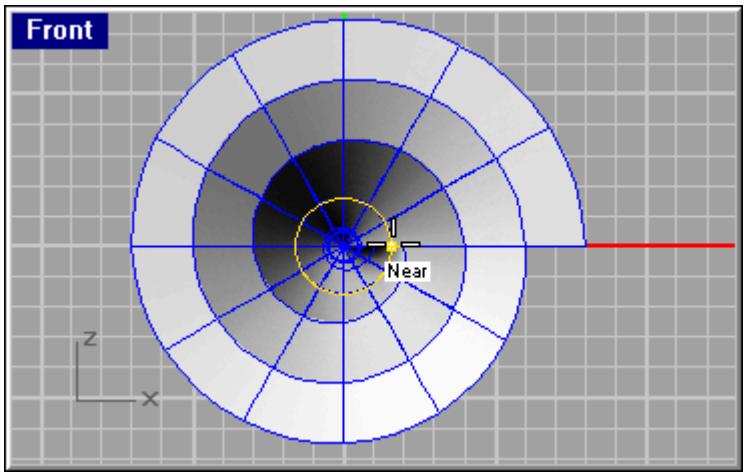
3. Set the radius to **1.6**.

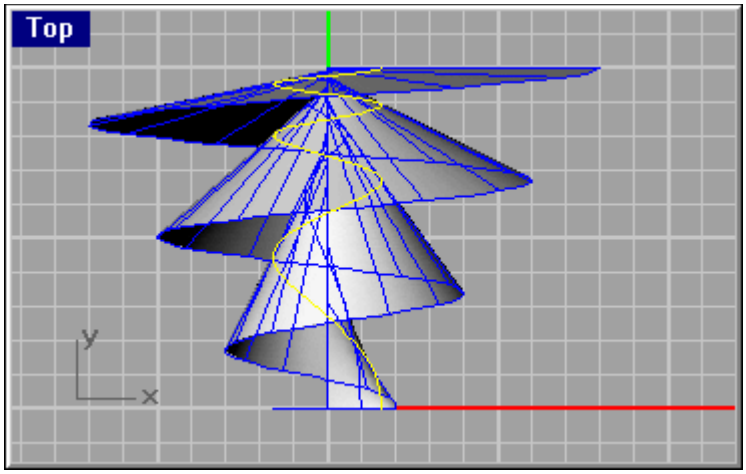


Extract an isoparm curve from the loft

1. Use the ExtractIsoparm command (u- or v- direction) to extract a curve from the loft surface.

2. in the **Front** viewport use the **Int** or **End** object snap on the circle to locate this curve.

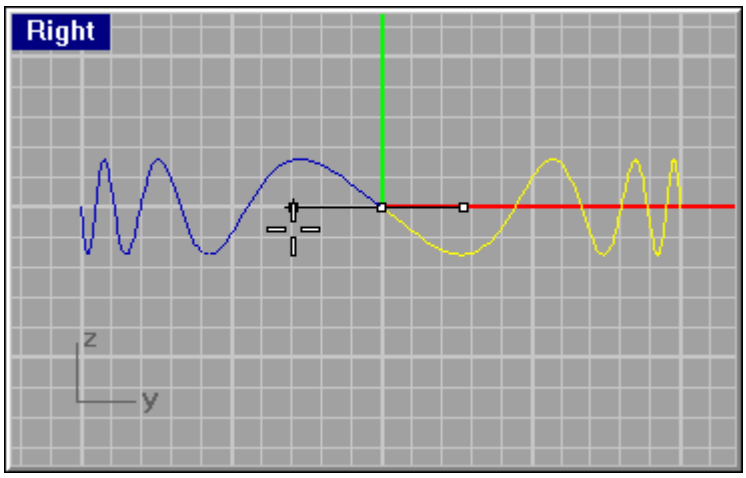




Rotate and join curve parts

1. In the **Right** viewport use the Rotate command with the *Copy* option to create the other half of the spring path by rotating the curve 180 degrees around its end point.

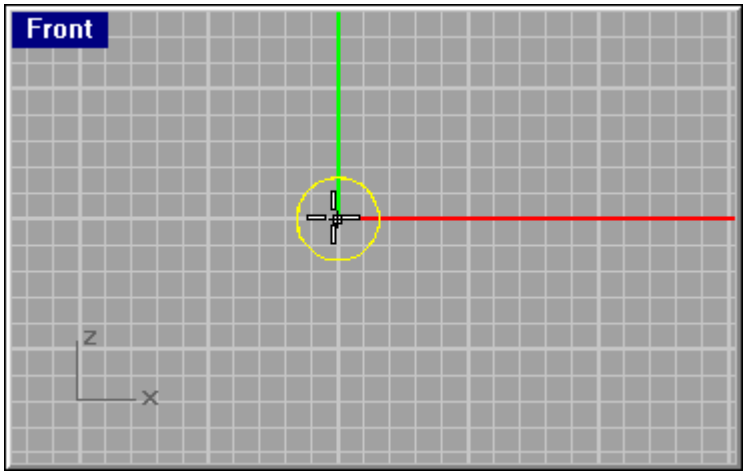
2. Use the Join command to make them into one curve.

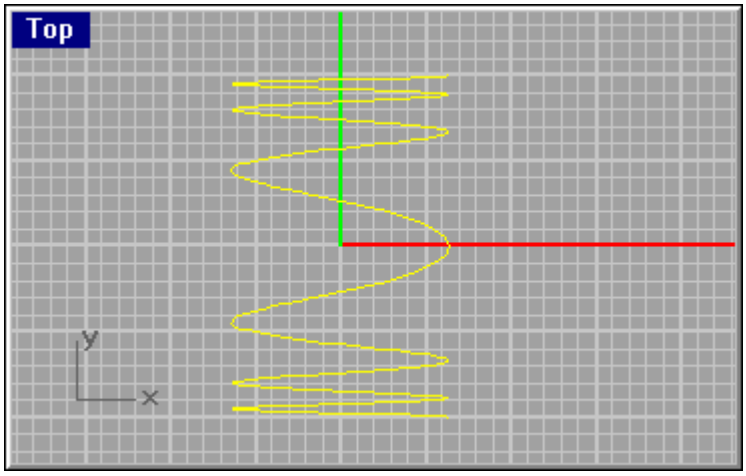


Scale the spring path diameter

The spring path is now 20 x 3.2 - pretty skinny.

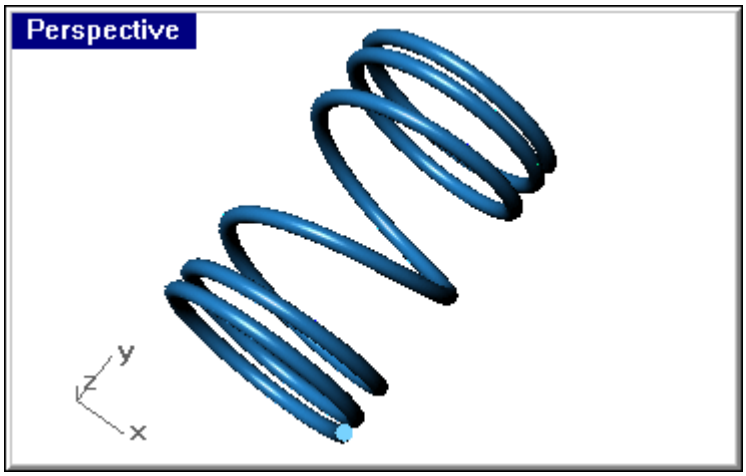
- In the **Front** viewport, use the Scale2D command to increase the diameter by a factor of 4 to make the spring path into 20 x 12.8.





Model the spring thickness

- Use the Pipe command to complete the spring with a radius.



Create different shapes for the spring

You can vary the weights of line to get lots of different-shaped springs, notice the isoparm extracted from the loft surface might have different radius in some cases.

To keep the spring at a constant radius, you can use a formula to draw the circle for snapping to when extracting the isoparm.

The formula is based on the square root of the weight that is applied to the line control point. If we call the square root of the weight SW, the formulae are:

When making the spiral:

big radius = small radius x SW

When drawing the circle (for snapping to when extracting isoparm):

circle radius = small radius x (SW/(1+SW))

So, if the weight was set to 9, and the small radius was 4, big radius would be:

4 x 3 = 12

And the circle would be:

4 x 3/4 = 3

If you use weights that are perfect squares like 4, 9, 16, or 25, calculations are pretty easy. Otherwise you have to get out the calculator.