Spline Options

The **SPLINE** command includes advanced options in addition to the **Undo** and **Close** options described in Chapter 4. The **Method**, **Knots**, **Object**, **start Tangency**, **end Tangency**, and **Tolerance** options allow you to adjust the shape of a spline. Although the default settings are appropriate for many common drawing applications, you can adjust spline options as needed. You might recognize some spline setting terminology and functions if you are familiar with spline theory and mathematical spline interpolation. *Spline interpolation* is the mathematical process of locating unknown points along a spline based on existing known points.

Spline Creation Methods

The **Method** option appears before you select the first spline point and allows you to adjust the spline creation method. You can apply the **Fit** method or the **CV** (control vertices) method. Specific additional options are available depending on the spline creation method you select.

Fit Method

The default **Fit** option forms a spline directly through the points you specify when you use a 0 tolerance. See **Figure 4C-1**. The **Fit** option is appropriate for most 2D drawing applications. The **Knots** option, which appears before you select the first fit point, allows you to specify how AutoCAD calculates the spline as it forms through the fit points. The **Knots** setting affects spline data, but it has little effect on the appearance of the spline and is only apparent when applied to splines with four or more fit points.

Figure 4C-1.
Drawing a spline with three fit points using the **Fit** spline creation method.

Spline passes through fit points

Second fit point

First fit point

Third fit point
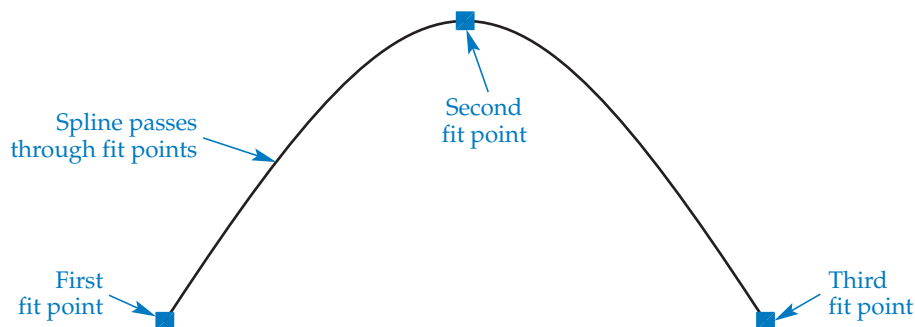
The default **Chord** option assigns a decimal value to fit points to identify the location of each point on the spline. The **Square Root** option identifies fit points according to the square root of the chord length between adjacent knot vectors. The **Uniform** option identifies fit points using consecutive integers.

Start and End Tangency

The **start Tangency** option is available after you select the first spline point using the **Fit** method. Use the **start Tangency** option and point entry or drawing aids to locate a point to specify the tangent direction of the first fit point. After you define the start tangency, continue drawing the spline as usual.

The **end Tangency** option is available after you select the second spline point using the **Fit** method. Use the **end Tangency** option and point entry or drawing aids to locate a point to specify the tangent direction of the last fit point. Selecting the end tangency direction ends the **SPLINE** command and creates the spline. **Figure 4C-2** shows examples of using start and end tangencies to modify the default shape of a spline significantly.

Tolerance

The **Tolerance** option is available after you select the first spline point using the **Fit** method. Use the **Tolerance** option to adjust the distance between the spline and the fit points, except the start point and endpoint. The default tolerance is 0. The larger the tolerance, the greater the distance between the spline and the fit points. See **Figure 4C-3**.

Figure 4C-2.
Examples of splines drawn through the same fit points, but using different start and end tangent directions. The arrows indicate the tangent directions.
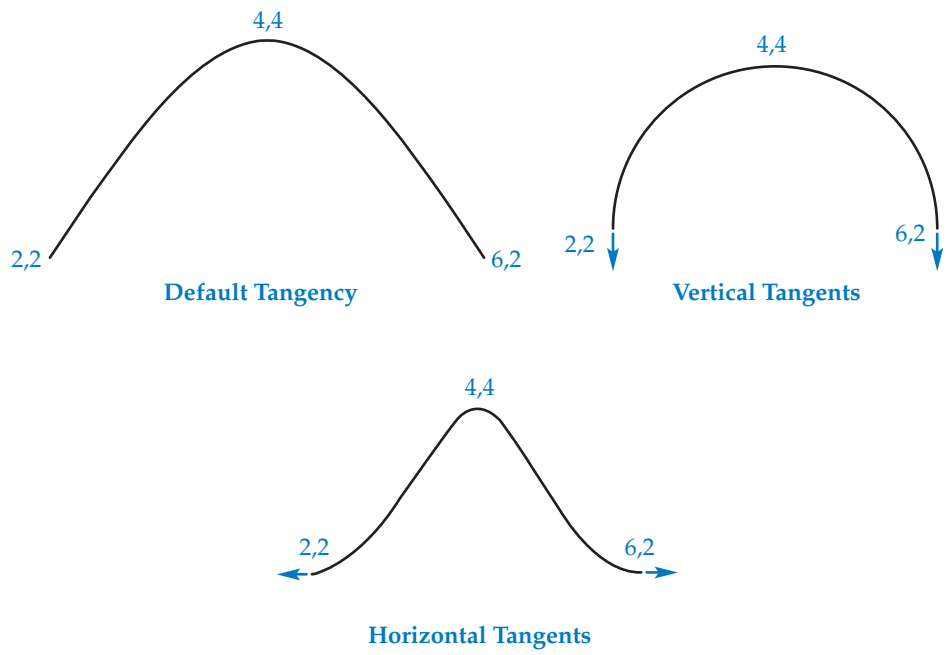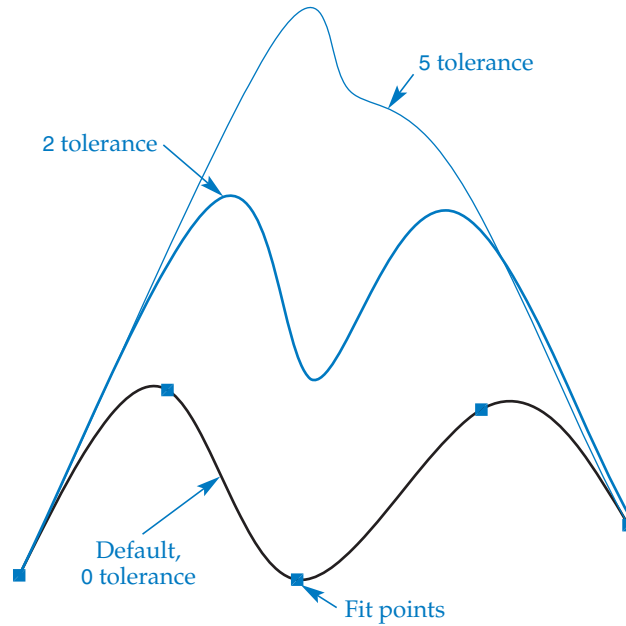

4,4
2,2
6,2
Default Tangency

4,4
2,2
6,2
Vertical Tangents

4,4
2,2
6,2
Horizontal Tangents

5 tolerance

2 tolerance

Default,
0 tolerance

Fit points

Control Vertices Method

Select the **CV** (control vertices) option to form a spline according to control vertices, or control points, you specify. See **Figure 4C-4**. The **Degree** option appears before you select the first spline point using the **CV** method. This option allows you to specify the degree applied to control points to affect the shape of the spline. You can specify a degree value from 1 to 10, but the number of degrees is always one less than the number of control points. For example, a degree of 6 has the same effect on a spline with 5 control points as a degree of 4. **Figure 4C-5** shows degrees affecting a spline with 5 control points.

Figure 4C-4.
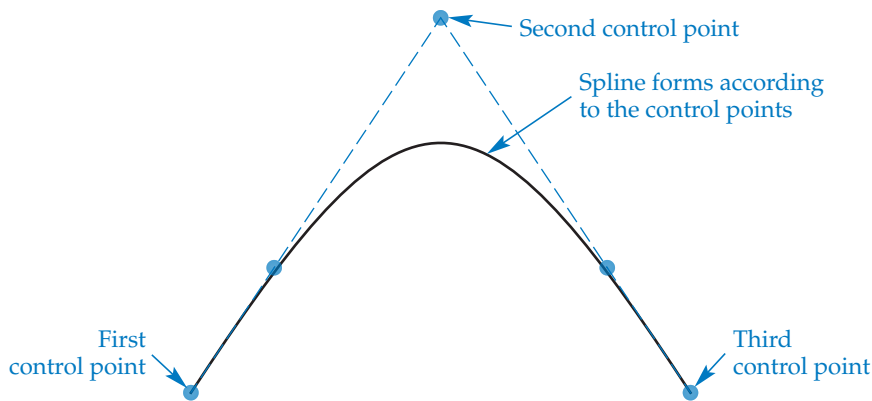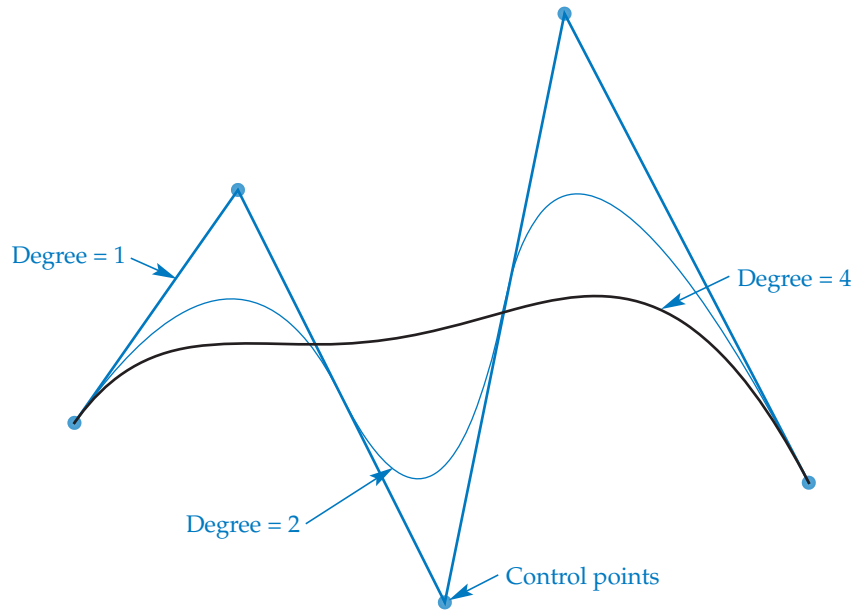Drawing a spline with three control points using the **CV** spline creation method.

Second control point

Spline forms according
to the control points

First
control point

Third
control point

Figure 4C-5.
Adjusting the control point degree to change the shape of a spline.

Degree = 1

Degree = 4

Degree = 2

Control points

Converting Polylines and Splines

You can use the **Object** option of the **SPLINE** command to convert a spline-fitted polyline object that was created using the **PEDIT** command to a spline object. Access the **SPLINE** command and activate the **Object** option instead of specifying points. Then pick a spline-fitted polyline object to convert the polyline to a spline. Chapter 14 explains the **PEDIT** command, editing polylines, and creating a spline-fitted polyline.