Spline Options

The SPLINE tool includes advanced options in addition to the Undo and Close options described in Chapter 4. The Method, Object, start Tangency, end Tangency, and tolerance options allow you to adjust the shape of a spline while drawing. Although the default settings are appropriate for many common drawing applications, you can adjust spline options as needed. You will probably recognize some spline setting terminology and functions only if you are familiar with spline theory and mathematical spline interpolation.

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 choose to apply a Fit method or a control vertices (CV) method. Specific additional options are available depending on the spline creation method you choose.

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

![Figure 4C-1](image-url). Drawing a spline with three fit points using the Fit spline creation method.

spline interpolation: The mathematical process of locating unknown points along a spline based on existing known points.
select the first fit point using the **Fit** method, 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.

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 tool 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

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**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.
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.

**Control Vertices Method**

Select the CV, or control vertices, option to form a spline according to control vertices, or control points, you specify. See Figure 4C-4. The cv option is most appropriate for creating a NURBS curve. 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 affect on a spline with 5 control points as a degree of 4. Figure 4C-5 shows degrees affecting a spline with 5 control points.

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**Figure 4C-3.** Adjusting the fit tolerance to change the shape of a spline.

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**NURBS curve**  A non-uniform rational B-spline that is commonly used to construct freeform 3D surfaces.
You can use the **Object** option of the **SPLINE** tool to convert a spline-fitted polyline object that was created using the **PEDIT** tool to a spline object. Access the **SPLINE** tool and activate the **Object** option instead of specifying points. Then pick a spline-fitted polyline object to convert the polyline to a spline. Chapter 15 explains editing polylines and creating a spline-fitted polyline.