

```
> # Prof. Dr. Serkan Dağ
# ME 310 Numerical Methods
# File 9.3
# Cubic Splines
```

```
> restart :
with(CurveFitting) :
Digits := 16 :
```

```
> # Define the data points
```

```
> X := [1, 2, 3, 5, 7, 8];
Y := [3, 6, 19, 99, 291, 444];
```

```
X := [1, 2, 3, 5, 7, 8]
Y := [3, 6, 19, 99, 291, 444]
```

(1)

```
> # Compute spline functions
```

```
> Spline(X, Y, x, degree = 3);
```

$$\left\{ \begin{array}{ll} \frac{414}{229} x^3 - \frac{1242}{229} x^2 + \frac{1515}{229} x & x < 2 \\ \frac{220}{229} x^3 - \frac{78}{229} x^2 - \frac{813}{229} x + \frac{1552}{229} & x < 3 \\ \frac{697}{916} x^3 + \frac{1335}{916} x^2 - \frac{8193}{916} x + \frac{11149}{916} & x < 5 \\ \frac{1731}{916} x^3 - \frac{14175}{916} x^2 + \frac{69357}{916} x - \frac{118101}{916} & x < 7 \\ -\frac{1848}{229} x^3 + \frac{44352}{229} x^2 - \frac{317931}{229} x + \frac{752772}{229} & \text{otherwise} \end{array} \right.$$

(2)

```
> # Numerical evaluation
```

```
> Spline(X, Y, 2.5, degree = 3);
```

```
10.78384279475983
```

(3)

```
> evalf( Spline(X, Y, 4, degree = 3) );
```

```
48.41157205240175
```

(4)

```
> f2 := \frac{220}{229} x^3 - \frac{78}{229} x^2 - \frac{813}{229} x + \frac{1552}{229};
```

```
f3 := \frac{697}{916} x^3 + \frac{1335}{916} x^2 - \frac{8193}{916} x + \frac{11149}{916};
```

```
f2 := \frac{220}{229} x^3 - \frac{78}{229} x^2 - \frac{813}{229} x + \frac{1552}{229}
```

```
f3 := \frac{697}{916} x^3 + \frac{1335}{916} x^2 - \frac{8193}{916} x + \frac{11149}{916}
```

(5)

```
> subs(x=3, f2);
```

```
19
```

(6)

```
> subs(x=3, f3);
```

```
19
```

(7)

```
>
```