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Linear spline interpolation

x - узлы интерполяции

f - значения функции в узлах интерполяции

```
interSplineL[x_, f_] := Module[{h = Table[x[[i]] - x[[i - 1]], {i, 2, Length@x}]},
   Table[ (x[[i + 1]] - v)/h[[i]] f[[i]] + (v - x[[i]])/h[[i]] f[[i + 1]], {i, 1, Length@x - 1}] // FullSimplify]
```

pol - построенный сплайн

point - интерполяционная сетка

```
visualization[pol_, point_] :=
 Show[{Table[Plot[pol[[i]] /. v → k, {k, point[[i, 1]], point[[i + 1, 1]]}], {i, 1, Length@pol}],
   Graphics[{PointSize[0.015], Red, Point[point]}]}, PlotRange → Full]
```
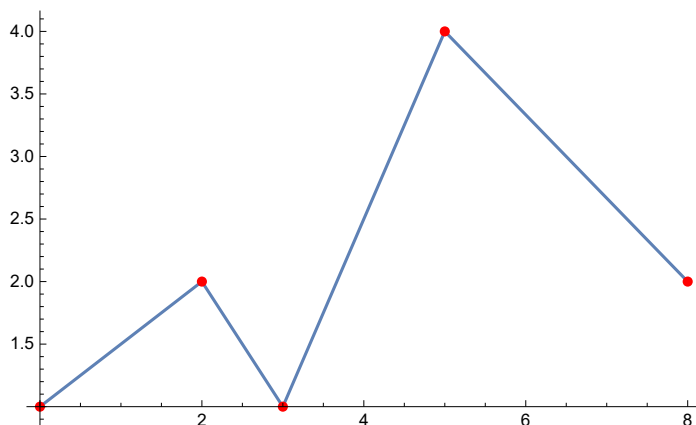
Test 1

```
x = {0, 2, 3, 5, 8};
f = {1, 2, 1, 4, 2};
point = {x, f} // Transpose;
```

```
interSplineL[x, f]
```

$$\left\{ \frac{2 + v}{2},\ 4 - v,\ \frac{1}{2}\left(-7 + 3v\right),\ -\frac{2}{3}\left(-11 + v\right) \right\}$$

```
visualization[interSplineL[x, f], point]
```


Quadratic spline interpolation

x - узлы интерполяции

f - значения функции в узлах интерполяции

```
interSplineQ[x_, f_] :=
 Module[{coef = Table[Inverse[{{(x[[i - 1]])^2, x[[i - 1]], 1}, {(x[[i]])^2, x[[i]], 1},
        {(x[[i + 1]])^2, x[[i + 1]], 1}}].{f[[i - 1]], f[[i]], f[[i + 1]]}, {i, 2, Length@x - 1}]},
  AppendTo[coef, Inverse[{{(x[[Length@x - 1]])^2, x[[Length@x - 1]], 1},
      {(x[[Length@x]])^2, x[[Length@x]], 1}, {0, 0, 1}}].{f[[Length@x - 1]], f[[Length@x]], 0}];
  Table[coef[[i, 1]] * (v)^2 + coef[[i, 2]] * (v) + coef[[i, 3]], {i, 1, Length@coef}]]
```

Test 1

```
x2 = RandomInteger[{0, 10}, 15] // Sort // DeleteDuplicates;
f2 = RandomInteger[{0, 10}, Length@x2];
point2 = {x2, f2} // Transpose;

visualization[x2, interSplineQ[x2, f2], point2]
```
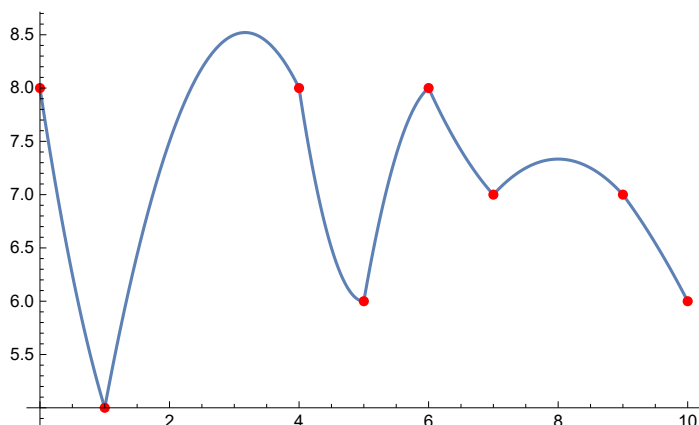

Test 2

```
xTest = RandomInteger[{-10, 10}, 100] // DeleteDuplicates // Sort;
fTest = Cos /@ xTest;
pointTest = {xTest, fTest} // Transpose;

polTest = interSplineQ[xTest, fTest] // N
```

$\{36.1363 + 7.88599\,v + 0.418844\,v^2,\ 10.7953 + 1.90269\,v + 0.066886\,v^2,$
$-12.358 - 4.2991\,v - 0.346567\,v^2,\ -16.3405 - 5.53178\,v - 0.441388\,v^2,$
$-7.01084 - 2.1109\,v - 0.130399\,v^2,\ 1.6067 + 1.767\,v + 0.300478\,v^2,$
$3.46213 + 2.84933\,v + 0.455097\,v^2,\ 1.87935 + 1.53035\,v + 0.191302\,v^2,$
$1. + 0.211322\,v - 0.248376\,v^2,\ 1. - 0.459698\,v^2,$
$1. - 0.211322\,v - 0.248376\,v^2,\ 1.87935 - 1.53035\,v + 0.191302\,v^2,$
$3.46213 - 2.84933\,v + 0.455097\,v^2,\ 1.6067 - 1.767\,v + 0.300478\,v^2,$
$-7.01084 + 2.1109\,v - 0.130399\,v^2,\ -16.3405 + 5.53178\,v - 0.441388\,v^2,$
$-12.358 + 4.2991\,v - 0.346567\,v^2,\ 10.7953 - 1.90269\,v + 0.066886\,v^2,$
$36.1363 - 7.88599\,v + 0.418844\,v^2,\ -0.257203\,v + 0.0173295\,v^2\}$

```
visualization[polTest, pointTest]
```