Interpolation

Problemstellung:
Gegeben: Koordinaten beliebiger Punkte von beliebiger Anzahl
Gesucht: Polynomfunktion, die durch diese Punkte verläuft

Es gibt immer eine Lösung.

Erster Algorithmus: Lagrange Interpolation

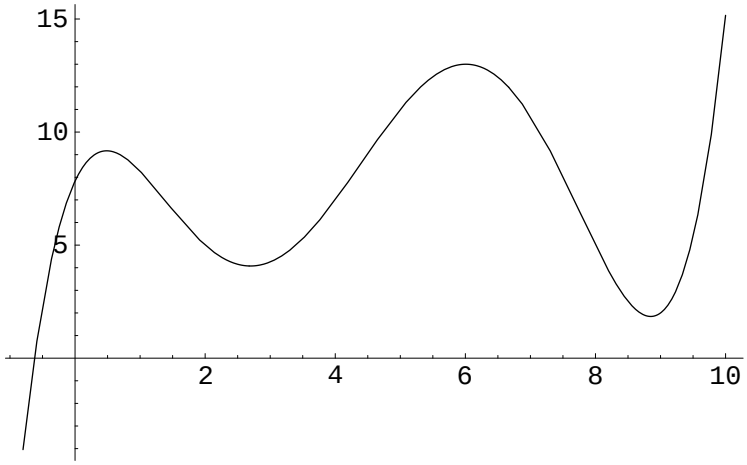
```
PolyFun[xl_, yl_] := Module[{n = Length[xl]}, Expand[∑_{i=1}^{n} yl[[i]] * P_i[xl, n]]]
```

$$P_{i\_}[xl\_, n\_] := \frac{\left(\prod_{j=1}^{i-1} (x - xl[[j]])\right) * \left(\prod_{j=i+1}^{n} (x - xl[[j]])\right)}{\left(\prod_{j=1}^{i-1} (xl[[i]] - xl[[j]])\right) * \left(\prod_{j=i+1}^{n} (xl[[i]] - xl[[j]])\right)}$$

```
PolyFun[{2, 6, 4, 8, 0.3, 9}, {5, 13, 7, 5, 9, 2}]
```

$$7.83275 + 6.11543\,x - 8.2723\,x^2 + 2.97382\,x^3 - 0.395377\,x^4 + 0.0175335\,x^5$$

```
Plot[%, {x, -0.8, 10}]
```




```
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```
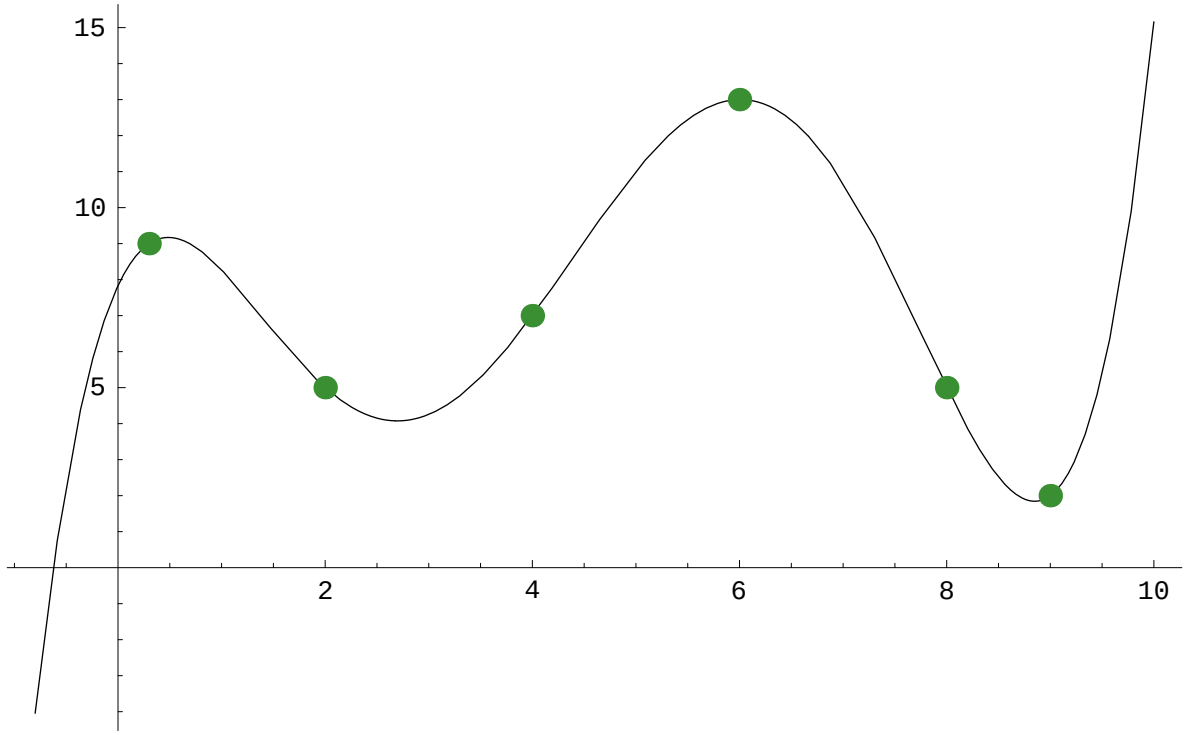

Zweiter Algorithmus: Neville Interpolation

```
IP[{x1_}, {y1_}] := y1

IP[{x1_, X___, xn_}, {y1_, y___, yn_}] :=
 Expand[(IP[{X, xn}, {y, yn}] * (x - x1) - IP[{x1, X}, {y1, y}] * (x - xn)) / (xn - x1)]
```

```
IP[{2, 6, 4, 8, 0.3, 9}, {5, 13, 7, 5, 9, 2}]
```

$$7.83275 + 6.11543\,x - 8.2723\,x^2 + 2.97382\,x^3 - 0.395377\,x^4 + 0.0175335\,x^5$$

```
IPPlot[X_List, Y_List] :=
 Module[{}, Plot[IP[X, Y], {x, -0.8, 10}, Epilog → {RGBColor[0.23, 0.56, 0.2],
     PointSize[0.02], Table[Point[{X[[i]], Y[[i]]}], {i, 1, Length[X]}]}]]

IPPlot[{2, 6, 4, 8, 0.3, 9}, {5, 13, 7, 5, 9, 2}]
```



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