Newton Interpolation

Q1 x= 3 5 6 9

f(x)=293 508 585 764

In[23]:=
```
points = {{3, 293}, {5, 508}, {6, 585}, {9, 764}};
```

In[24]:=
```
n = Length[points]
y = points[[All, 1]]
f = points[[All, 2]]
dd[k_] := Sum[(f[[i]] / Product[If[Equal[j, i], 1, (y[[i]] - y[[j]])], {j, 1, k}]), {i, 1, k}]
p[x_] = Sum[(dd[i] * Product[If[i ≤ j, 1, x - y[[j]]], {j, 1, i - 1}]), {i, 1, n}]
Simplify[p[x]]
Evaluate[p[5.5]]
```

Out[24]= 4

Out[25]= {3, 5, 6, 9}

Out[26]= {293, 508, 585, 764}

Out[28]= $293 + \frac{215}{2}(-3+x) - \frac{61}{6}(-5+x)(-3+x) + \frac{35}{36}(-6+x)(-5+x)(-3+x)$

Out[29]= $\frac{1}{36}\left(-9702 + 9003\,x - 856\,x^2 + 35\,x^3\right)$

Out[30]= 548.434

Q2 x= 4 5 7 10 11 13

f(x)=48 100 294 900 1210 2025

In[38]:=
```
points = {{4, 48}, {5, 100}, {7, 294}, {10, 900}, {11, 1210}, {13, 2025}};
```

In[39]:=
```
n = Length[points]
y = points[[All, 1]]
f = points[[All, 2]]
dd[k_] := Sum[(f[[i]] / Product[If[Equal[j, i], 1, (y[[i]] - y[[j]])], {j, 1, k}]), {i, 1, k}]
p[x_] = Sum[(dd[i] * Product[If[i ≤ j, 1, x - y[[j]]], {j, 1, i - 1}]), {i, 1, n}]
Simplify[p[x]]
Evaluate[p[10.79]]
```

Out[39]= 6

Out[40]= {4, 5, 7, 10, 11, 13}

Out[41]= {48, 100, 294, 900, 1210, 2025}

Out[43]=
$$48 + 52\,(-4 + x) + 15\,(-5 + x)\,(-4 + x) + (-7 + x)\,(-5 + x)\,(-4 + x) - \frac{1}{864}\,(-11 + x)\,(-10 + x)\,(-7 + x)\,(-5 + x)\,(-4 + x)$$

Out[44]=
$$\frac{1}{864}\left(15\,400 - 12\,070\,x + 2779\,x^2 + 335\,x^3 + 37\,x^4 - x^5\right)$$

Out[45]= 1139.82