Lagrange Interpolation Method

In[22]:=

In[23]:=

In[24]:=
```
xi = {-1, 0, 1, 2};
fi = {5, 1, 1, 11};
n = Length[xi];
For[k = 1, k ≤ n, k++,
Subscript[L, k][x_] = Product[(x - xi[[j]]) / (xi[[k]] - xi[[j]]), {j, 1, k - 1}] *
    Product[(x - xi[[j]]) / (xi[[k]] - xi[[j]]), {j, k + 1, n}]];
p[x_] = Sum[Subscript[L, k][x] * fi[[k]], {k, 1, n}];
Print["Lagrange Polynomial p(x) =", p[x]] ×
 Print["Simplified polynomial p(x) =", Simplify[p[x]]]

Print["Approximate value of f at x=1.5 is ", p[1.5]]
```

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Lagrange Polynomial p(x) =
```

$$-\frac{5}{6}(1-x)(2-x)x+\frac{1}{2}(1-x)(2-x)(1+x)+\frac{1}{2}(2-x)x(1+x)+\frac{11}{6}(-1+x)x(1+x)$$

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Simplified polynomial p(x) =1 - 3 x + 2 x^2 + x^3
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Out[29]= Null^2

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Approximate value of f at x=1.5 is 4.375
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In[31]:=
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Quit[]
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In[1]:=
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xi = {4, 5, 7, 10, 15};
fi = {48, 100, 200, 300, 350};
n = Length[xi];
For[k = 1, k ≤ n, k++, Subscript[L, k][x_] := Product[(x - xi[[j]]) / (xi[[k]] - xi[[j]]), {j, 1, k - 1}] *
    Product[(x - xi[[j]]) / (xi[[k]] - xi[[j]]), {j, k + 1, n}]];
p[x_] = Sum[Subscript[L, k][x] * fi[[k]], {k, 1, n}];
Print["Lagrange Polynomial p(x) =", p[x]] × Print["Simplified polynomial p(x) =",
  Simplify[p[x]]] × Print["Approximate value of f at x=6 is ", p[6]]
```

Lagrange Polynomial $p(x) = \frac{8}{33}(5-x)(7-x)(10-x)(15-x) + (7-x)(10-x)(15-x)(-4+x) + \frac{25}{18}(10-x)(15-x)(-5+x)(-4+x) + \frac{2}{3}(15-x)(-7+x)(-5+x)(-4+x) + \frac{7}{88}(-10+x)(-7+x)(-5+x)(-4+x)$

Simplified polynomial $p(x) = \frac{1}{792}\left(-39\,000 - 17\,230\,x + 13\,609\,x^2 - 1262\,x^3 + 35\,x^4\right)$

Approximate value of f at x=6 is $\frac{1671}{11}$

Out[1]= Null^3