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20222756
PRACTICAL 7
Lagrange Method

In[11]:=
```
LagrangePolynomial[x0_, f0_] :=
 Module[{xi = x0, fi = f0, n, m, polynomial},
  n = Length[xi];
  m = Length[fi];
  If[n ≠ m,
   Print["List of points and function's values are not of same size"];
   Return[];];
  For[i = 1, i ≤ n, i++,
   L[i, x_] = (Product[(x - xi[[j]]) / xi[[i]] - xi[[j]]), {j, 1, i - 1}]) *
      (Product[(x - xi[[j]]) / (xi[[i]] - xi[[j]]), {j, i + 1, n}]);];

  polynomial[x_] = Sum[L[k, x] * fi[[k]], {k, 1, n}];

  Return[polynomial[x]];]
```

ques1

```
nodes = {0, 1, 3};
values = {1, 3, 55};
lagrangePolynomial[x_] = LagrangePolynomial[nodes, values]
```

In[9]:=
$$\frac{1}{3}(1-x)(3-x)+\frac{3}{2}(3-x)x+55\left(-\frac{4}{3}+x\right)x$$

Out[9]=
$$\frac{1}{3}(1-x)(3-x)+\frac{3}{2}(3-x)x+55\left(-\frac{4}{3}+x\right)x$$

```
Expand[%]
```

In[10]:=
$$1 - \frac{421\,x}{6} + \frac{323\,x^2}{6}$$

Out[10]=
$$1 - \frac{421\,x}{6} + \frac{323\,x^2}{6}$$

Power: Infinite expression $\frac{1}{0}$ encountered.

General: Further output of Power::infy will be suppressed during this calculation.

In[22]:=
```
Ques - 2

nodes = {0, 1, 3};
values = {1, 3};
lagrangePolynomial[x_] = LagrangePolynomial[nodes, values]
```

Out[22]=
$$-2 + \text{Ques}$$

```
List of points and function's values are not of same size
```

In[26]:=
```
nodes = {1, 3, 5, 7, 9};
values = {N[Log[1]], N[Log[3]], N[Log[5]], N[Log[7]], N[Log[9]]};
lagrangePolynomial[x_] = LagrangePolynomial[nodes, values]
```

Out[28]=
$$0. + 0.0228878\,(5-x)\,(7-x)\,(9-x)\left(-\frac{4}{3}+x\right) + 0.20118\,(7-x)\,(9-x)\left(-\frac{18}{5}+x\right)\left(-\frac{6}{5}+x\right) + 0.972955\,(9-x)\left(-\frac{40}{7}+x\right)\left(-\frac{24}{7}+x\right)\left(-\frac{8}{7}+x\right) + 2.19722\left(-\frac{70}{9}+x\right)\left(-\frac{50}{9}+x\right)\left(-\frac{10}{3}+x\right)\left(-\frac{10}{9}+x\right)$$