

```

Exit[];

c = {1 - 3 n^2 x^2 + 2 n^3 x^3, 3 n^2 x^2 - 2 n^3 x^3, x - 2 n x^2 + n^2 x^3, -n x^2 + n^2 x^3}
{1 - 3 n^2 x^2 + 2 n^3 x^3, 3 n^2 x^2 - 2 n^3 x^3, x - 2 n x^2 + n^2 x^3, -n x^2 + n^2 x^3}

b = 1 / n;

Y[i_, h_] := {Y[i], Y[i+1], m[i], m[i+1]}.c /. x -> h;
{Y[i, 0], Y[i, 1/n], D[Y[i, x], x] /. x -> 0, D[Y[i, x], x] /. x -> 1/n}
{Y[i], Y[1+i], m[i], m[1+i]}

Simplify[(D[Y[1, x], {x, 2}] / 4 / n /. x -> 0) == 0]
2 m[1] + m[2] + 3 n y[1] == 3 n y[2]

Simplify[(D[Y[n, x], {x, 2}] / 4 / n /. x -> b) == 0]
m[n] + 2 m[1+n] + 3 n y[n] == 3 n y[1+n]

Simplify[(D[Y[i, x], {x, 2}] / 4 / n /. x -> b) == (D[Y[i+1, x], {x, 2}] / 4 / n /. x -> 0)]
m[i] + 4 m[1+i] + m[2+i] + 3 n y[i] == 3 n y[2+i]

M[n_] := SparseArray[{{1, 1} -> -2, (n+1) {1, 1} -> 2,
  {n+1, n} -> -2, {1, 2} -> 2, {i_, j_} /; (i == j+1 && i < n+1 && i > 1) -> -1,
  {i_, j_} /; (i == j-1 && i < n+1 && i > 1) -> 1}, (n+1) {1, 1}];
M[5] // MatrixForm

$$\begin{pmatrix} -2 & 2 & 0 & 0 & 0 & 0 \\ -1 & 0 & 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 & 1 & 0 \\ 0 & 0 & 0 & -1 & 0 & 1 \\ 0 & 0 & 0 & 0 & -2 & 2 \end{pmatrix}$$


```

los:

```

y = Transpose[XY][[2]]; y = Table[y[[i]], {i, 1, Length[y], 20}];
If[y[[Length[y]]] != XY[[Length[XY], 2]], AppendTo[y, XY[[Length[XY], 2]]];
n = Length[y] - 1; m = M[n].y;

For[i = 1, i <= n, i++,
  delta = (y[[i+1]] - y[[i]]) n;
  If[delta == 0, m[[i]] = 0; m[[i+1]] = 0,
    a = m[[i]] / delta; b = m[[i+1]] / delta;
    If[a^2 + b^2 > 3,
      t = 3 / Sqrt[a^2 + b^2]; m[[i]] = t a delta; m[[i+1]] = t b delta;
    ]];

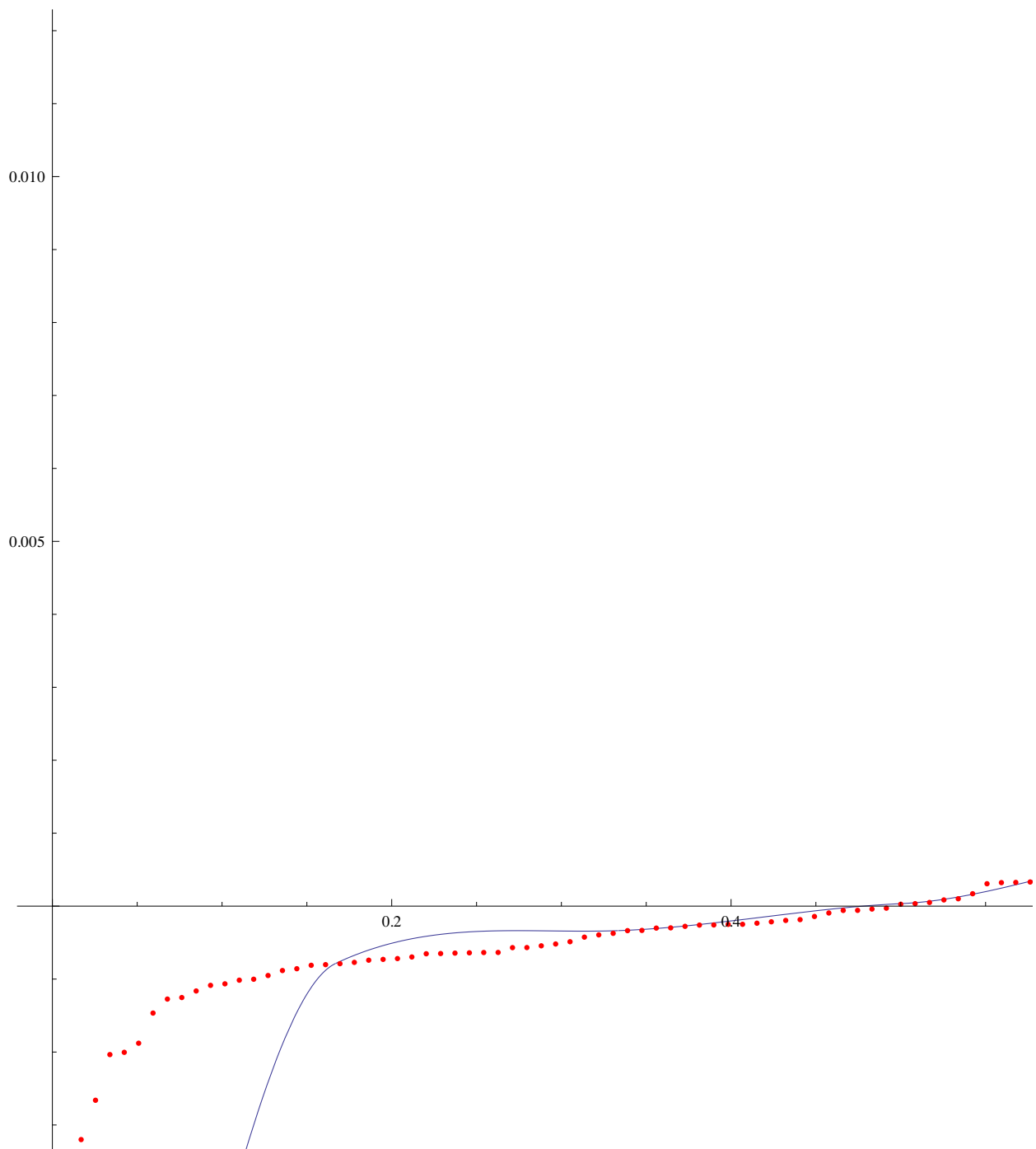
```

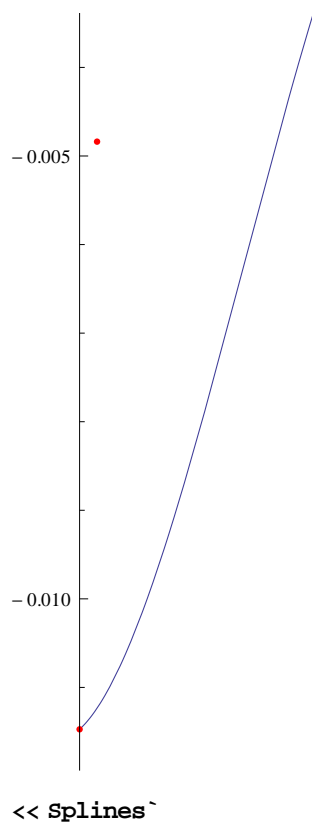
```

Y[x0_] := Module[{i, x = x0, y = y, m = m, c = c, n = n},
  i = Ceiling[x * n];
  x -= (i - 1) / n;
  {Y[[i]], Y[[i + 1]], m[[i]], m[[i + 1]]}.
  {1 - 3 n^2 x^2 + 2 n^3 x^3, 3 n^2 x^2 - 2 n^3 x^3, x - 2 n x^2 + n^2 x^3, -n x^2 + n^2 x^3}
]

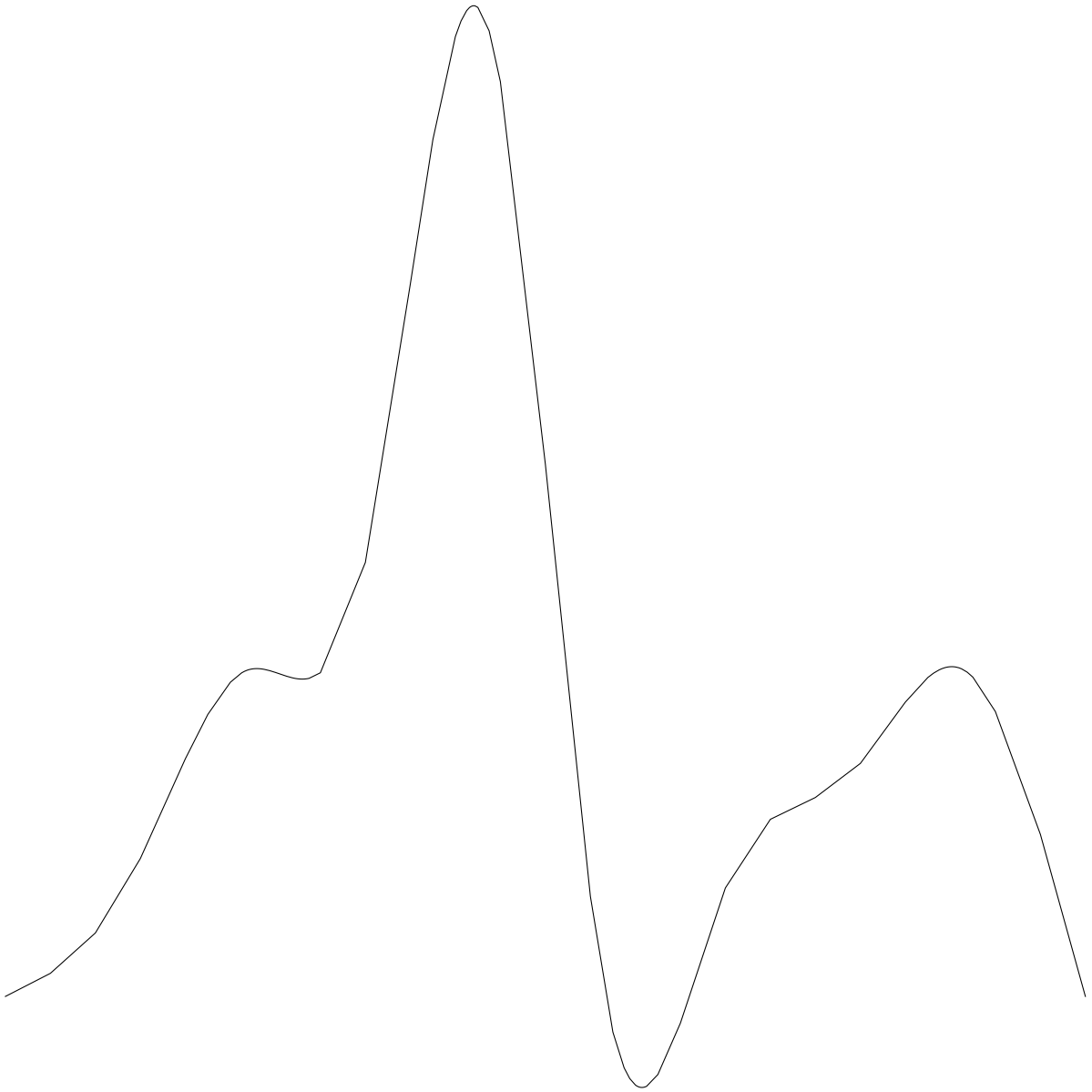
Show[Plot[Y[x], {x, 0, 1}, AspectRatio -> 1, PlotRange -> All],
ListPlot[XY, PlotStyle -> Red]]

```





```
Graphics[Spline[Table[{i / (Length[y] - 1), y[[i + 1]]}, {i, 0, Length[y] - 1}], Cubic],
  AspectRatio -> 1]
```



```
Y[x0_] := Module[{i = n, x = x0, p = y, m = m, n = n, b, y},
  If[x == 0, i = 1,
    While[x ≤ (i - 1) / n, i--];];
  b = 1 / n;
  x -= (i - 1) / n;
  {p[[i]], p[[i + 1]], m[[i, 1]], m[[i, 2]]}.
  {1 - 3 n^2 x^2 + 2 n^3 x^3, 3 n^2 x^2 - 2 n^3 x^3, x - 2 n x^2 + n^2 x^3, -n x^2 + n^2 x^3}
]
```

```

y = {XY[[1, 2]], XY[[Length[XY], 2]]}; y = Transpose[XY][[2]];
y = Table[y[[i]], {i, 1, Length[y], 1}];
If[y[[Length[y]]] ≠ XY[[Length[XY], 2]], AppendTo[y, XY[[Length[XY], 2]]];

n = Length[y] - 1;

n
6

m = Table[ts[i, j], {i, 2 n}, {j, 2}];

d = (Y[#[[1]]] - #[[2]])^2 & /@ XY; d = Sum[d[[i]], {i, Length[d]}];
g = Solve[Flatten[Table[D[d, ts[i, j]] == 0, {i, 2 n}, {j, 2}], Flatten[m]][[1]]

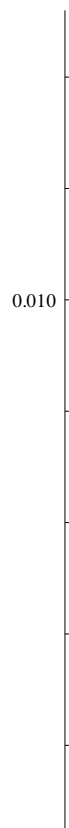
m = Table[ts[i, j], {i, 2 n}, {j, 2}] /. g;

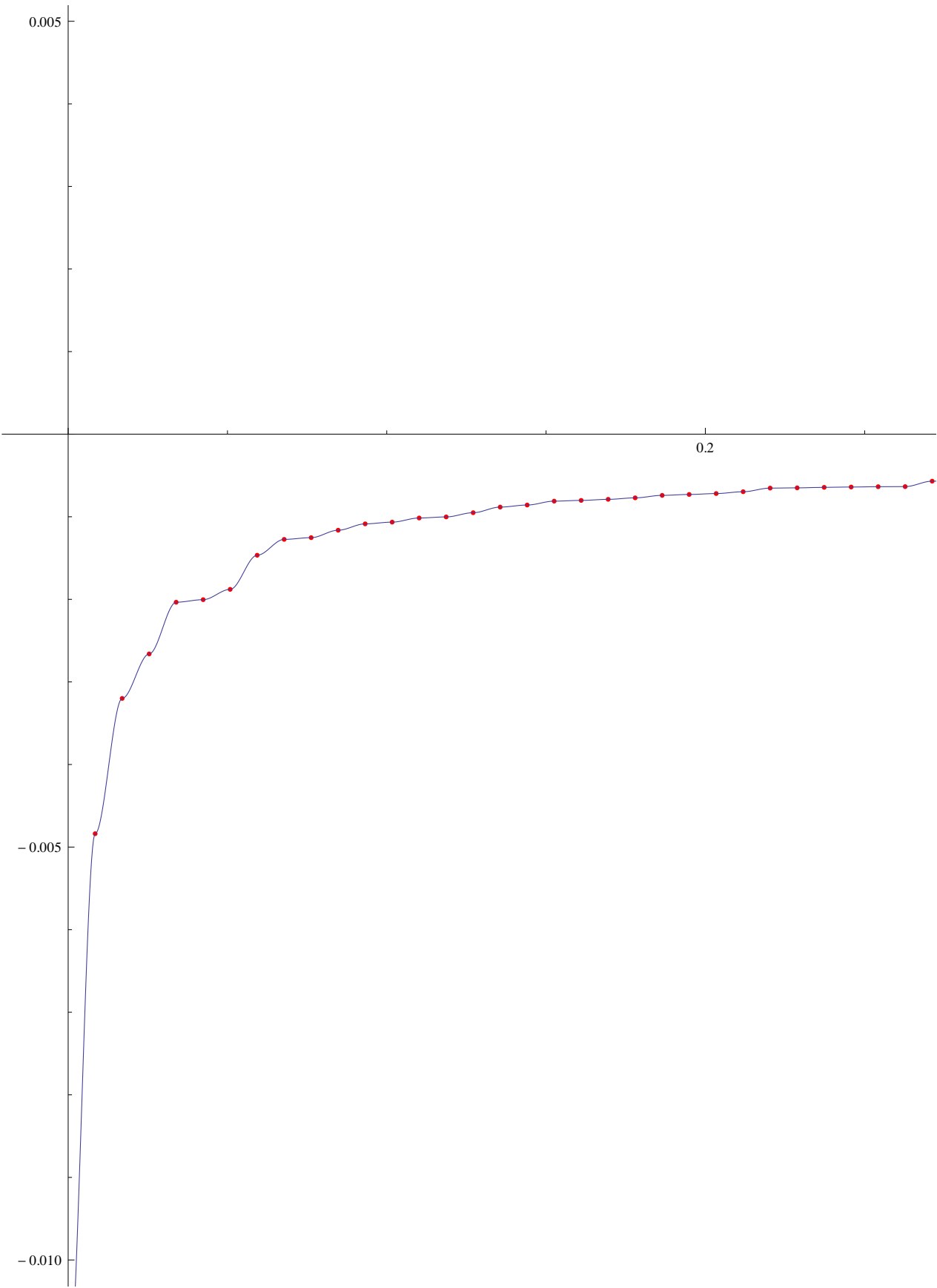
m[[1 ;; n]] = 0 n / 2 M[n].y;

m = Table[ts[i, j], {i, n}, {j, 2}] /. g;
For[i = 1, i ≤ n, i++,
  delta = (P[[i + 1, 2]] - P[[i, 2]]) / (P[[i + 1, 1]] - P[[i, 1]]);
  a = m[[i]] / delta; b = m[[i + 1]] / delta;
  If[a^2 + b^2 > 3,
    t = 3 / Sqrt[a^2 + b^2]; m[[i]] = t a delta; m[[i + 1]] = t b delta;]
]; m

Show[ListPlot[{XY}, PlotRange → All, PlotStyle → Red],
  Plot[Y[x], {x, 0, 1}, PlotRange → All]]

```







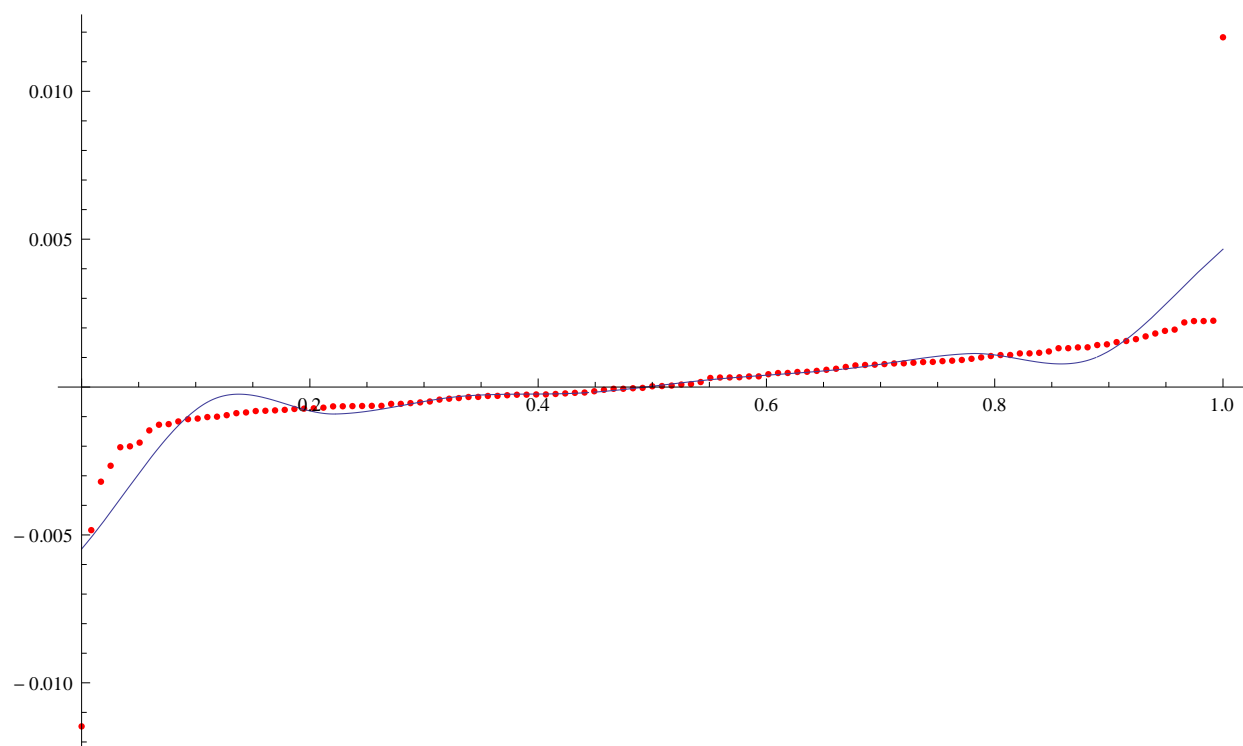
```
Solve[Table[D[d, ys[i]] == 0, {i, nN}], Table[ys[i], {i, nN}]]
{{ys[1] → -0.00547464, ys[2] → -0.000492335, ys[3] → -0.000911088,
  ys[4] → -0.00031071, ys[5] → -0.000185091, ys[6] → 0.000265952,
  ys[7] → 0.00060474, ys[8] → 0.00113058, ys[9] → 0.00100276, ys[10] → 0.0046597}}

y = Table[ys[i], {i, nN}] /. %[[1]];

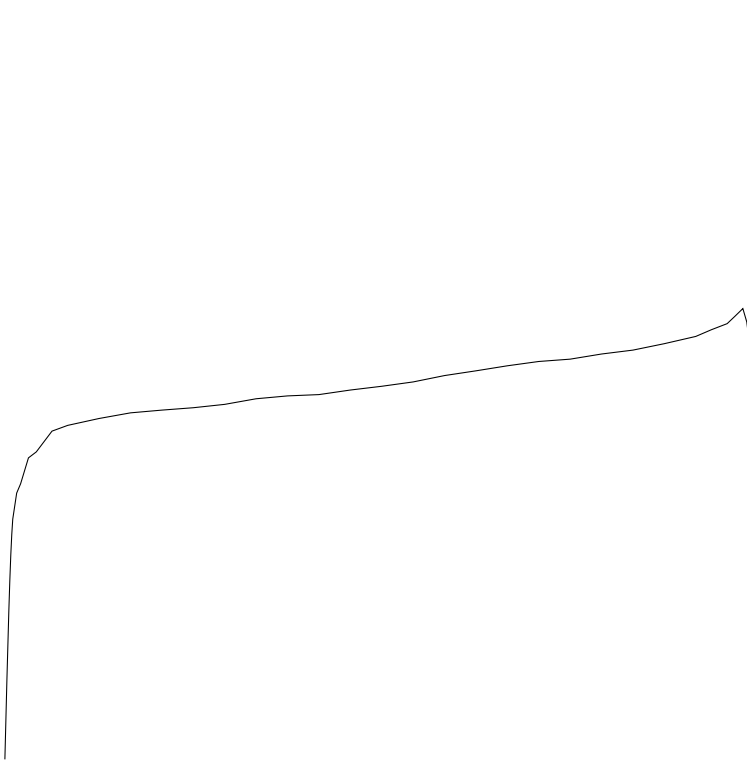
nN = 10; y = Table[ys[i], {i, nN}];

m = n / 2 M[n].y; n = Length[y] - 1;
d = (Y[#[[1]]] - #[[2]])^2 & /@ XY; d = Sum[d[[i]], {i, Length[d]}]
Show[ListPlot[XY, PlotStyle → Red, PlotRange → All],
  Plot[Y[x], {x, 0, 1}, PlotRange → All]]
```

0.000118941



```
Graphics[Spline[XY, Cubic], AspectRatio -> 1]
```



```
Y[0]
```

```
0.01
```

```
{#[[1]]} & /@ XY
```

```
{0.}, {0.008475}, {0.016949}, {0.025424}, {0.033898}, {0.042373}, {0.050847},
{0.059322}, {0.067797}, {0.076271}, {0.084746}, {0.09322}, {0.101695}, {0.110169},
{0.118644}, {0.127119}, {0.135593}, {0.144068}, {0.152542}, {0.161017}, {0.169492},
{0.177966}, {0.186441}, {0.194915}, {0.20339}, {0.211864}, {0.220339}, {0.228814},
{0.237288}, {0.245763}, {0.254237}, {0.262712}, {0.271186}, {0.279661}, {0.288136},
{0.29661}, {0.305085}, {0.313559}, {0.322034}, {0.330508}, {0.338983}, {0.347458},
{0.355932}, {0.364407}, {0.372881}, {0.381356}, {0.389831}, {0.398305}, {0.40678},
{0.415254}, {0.423729}, {0.432203}, {0.440678}, {0.449153}, {0.457627}, {0.466102},
{0.474576}, {0.483051}, {0.491525}, {0.5}, {0.508475}, {0.516949}, {0.525424},
{0.533898}, {0.542373}, {0.550847}, {0.559322}, {0.567797}, {0.576271}, {0.584746},
{0.59322}, {0.601695}, {0.610169}, {0.618644}, {0.627119}, {0.635593}, {0.644068},
{0.652542}, {0.661017}, {0.669492}, {0.677966}, {0.686441}, {0.694915}, {0.70339},
{0.711864}, {0.720339}, {0.728814}, {0.737288}, {0.745763}, {0.754237}, {0.762712},
{0.771186}, {0.779661}, {0.788136}, {0.79661}, {0.805085}, {0.813559}, {0.822034},
{0.830508}, {0.838983}, {0.847458}, {0.855932}, {0.864407}, {0.872881}, {0.881356},
{0.889831}, {0.898305}, {0.90678}, {0.915254}, {0.923729}, {0.932203}, {0.940678},
{0.949153}, {0.957627}, {0.966102}, {0.974576}, {0.983051}, {0.991525}, {1.}]
```



```
Export["c:\\sdasd.txt", {Round[#[[1]]], #[[2]]} & /@ (XY * (Length[XY] - 1))]
```

c:\\sdasd.txt