

Example of Polynomial Interpolation

Find the interpolant of the following data points:

x	1.6	1.8	1.9	2.0
y	.82436	.44816	.43465	.46855

There is an unique cubic polynomial on the given 4 data points.

General Form: $c_1 + c_2x + c_3x^2 + c_4x^3 = y$

Each data point should satisfy the equation above. Substitute each data point into this equation to get a system of equations.

$$\begin{cases} c_1 + c_2(1.6) + c_3(1.6)^2 + c_4(1.6)^3 = .82436 \\ c_1 + c_2(1.8) + c_3(1.8)^2 + c_4(1.8)^3 = .44816 \\ c_1 + c_2(1.9) + c_3(1.9)^2 + c_4(1.9)^3 = .43465 \\ c_1 + c_2(2.0) + c_3(2.0)^2 + c_4(2.0)^3 = .46855 \end{cases}$$

Use Matlab to solve the system:

```
>> V=[1 1.6 1.6^2 1.6^3;1 1.8 1.8^2 1.8^3;1 1.9 1.9^2 1.9^3;1 2 2^2 2^3]
V =
```

```
1.0000 1.6000 2.5600 4.0960
1.0000 1.8000 3.2400 5.8320
1.0000 1.9000 3.6100 6.8590
1.0000 2.0000 4.0000 8.0000
```

```
>> Y=[.82436;.44816;.43465;.46855]
Y =
```

```
0.8244
0.4482
0.4346
0.4686
```

```
>> inv(V)*Y
ans =
```

```
67.7792
-102.2059
51.5211
-8.6229
```

The interpolant is : $y = 67.7792 - 102.2059x + 51.5211x^2 - 8.6229x^3$