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## Aufgabe 9.42

dbtype [aufgabe942.m](#)  
aufgabe942

```
1      x = (0:8)';
2      y = [1:5,-3:0]';
3      z = linspace(0,8,1000);
4
5      % a)
6      pot=(0:8)';
7      n = length(x);
8      % a)
9      M1 = zeros(n,n);
10     % b)
11     M2 = zeros(n,n);
12     % c)
13     M3_1 = zeros(n,n);
14     M3_2 = zeros(n,n);
15
16     e = inline('exp(-sigma*(x-x_k).^2)','x','x_k','sigma');
17     dbtype func942_b.m
18
19     for j=1:n
20         % a)
21         M1(j,:) = (x(j)).^pot;
22         % b)
23         M2(j,:) = func942_b(x(j));
24         % c)
25         M3_1(j,:) = e(x,x(j),1);
26         M3_10(j,:) = e(x,x(j),10);
27     end
28
29     % a)
30     c1 = M1\y;
31     c1
32     % b)
33     c2 = M2\y;
34     c2
35     % c)
36     c3_1 = M3_1\y;
37     c3_1
38     c3_10 = M3_10\y;
39     c3_10
40
41     f1 = [];
42     f2 = [];
43     f3_1 = [];
44     f3_10 = [];
45
46     for k=1:length(z)
```

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```

47         % a)
48         tmp = c1' * ( (z(k)).^pot);
49         f1 = [f1;tmp];
50
51         % b)
52         tmp = c2' * func942_b(z(k));
53         f2 = [f2;tmp];
54
55         % c)
56         tmp = c3_1' * e(x,z(k),1);
57         f3_1 = [f3_1;tmp];
58
59         tmp = c3_10' * e(x,z(k),10);
60         f3_10 = [f3_10;tmp];
61
62     end
63
64     plot(x,y,'o',z,f1,z,f2,z,f3_1,z,f3_10)
65     legend('Daten','Monome','Huetchen','sigma = 1','sigma = 10');
66     axis([0,8,-14,6])

1     function vecu=func942_b(x)
2     vecu = zeros(8,1);
3
4     for k=0:8
5         if k == 0
6             if (x>=0 && x<1)
7                 u=1-x;
8             else
9                 u=0;
10            end
11        elseif k == 8
12            if (x>=7 && x<=8)
13                u = x-7;
14            else
15                u = 0;
16            end
17        else
18            if (x>=k-1 && x<k)
19                u = x-(k-1);
20            elseif (x>=k && x<k+1)
21                u = k+1-x;
22            else
23                u=0;
24            end
25        end
26    end
27    vecu(k+1) = u;
28
29    end
30

c1 =

```

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---

```
1.0000
-66.9607
170.2187
-162.7812
78.6328
-21.0125
3.1406
-0.2455
0.0078
```

*Warning: Matrix is singular to working precision.*

*c2 =*

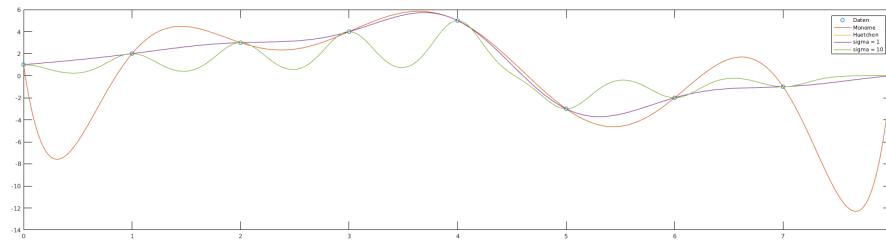
```
Inf
NaN
NaN
NaN
NaN
NaN
NaN
NaN
NaN
NaN
```

*c3\_1 =*

```
0.6137
0.9387
2.2295
0.7924
6.7215
-5.6012
0.3683
-1.1929
0.4328
```

*c3\_10 =*

```
0.9999
1.9998
2.9997
3.9996
5.0000
-3.0001
-1.9998
-0.9999
0.0000
```



## Aufgabe 9.44

dbtype [aufgabe944.m](#)  
aufgabe944

```

1
2     x0 = 10*rand(5,1)-5;
3     p_coeff=[-5 -3 9 8 -3];
4
5     y0=polyval(p_coeff,x0);
6
7     x = linspace(-5,5)';
8     y = polyval(p_coeff,x);
9
10    dbtype newtonIntpol.m
11    p = newtonIntpol(x0,y0,x);
12    plot(x0,y0,'o',x,p)
13
14    display(' ||p(x_eval)-y_{exakt}||_{\infty} ')
15    max(abs(y-p))

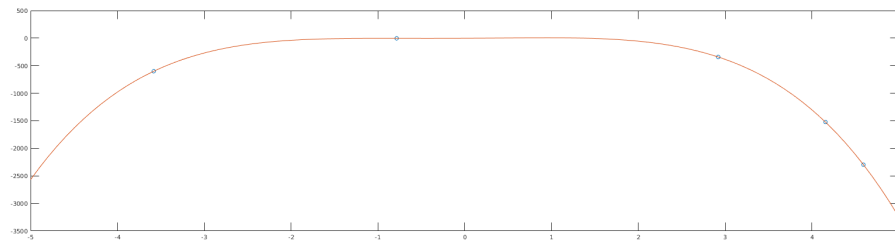
1     function p=newtonIntpol(x0,y0,x)
2
3     n=length(y0);
4     c=y0;
5     coeff=[y0(1);zeros(n-1,1)];
6
7     for j=1:n-1
8
9         c = (c(2:n-j+1)-c(1:n-j))./(x0(1+j:n)-x0(1:n-j));
10        coeff(j+1) = c(1);
11    end
12
13    p = (x-x0(n-1))*coeff(n);
14    for k=n-1:-1:2
15        p=(x-x0(k-1)).*(coeff(k)+p);
16    end
17    p=p+coeff(1);
18
19    end
||p(x_eval)-y_{exakt}||_{\infty}

ans =

```

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$1.8190e-12$



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