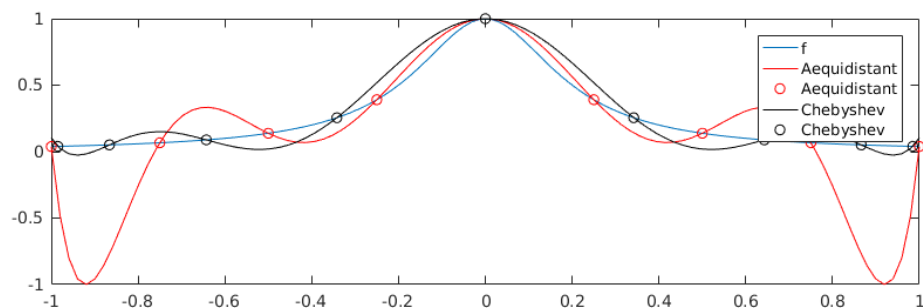

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Aufgabe 10.48

dbtype `rungephaenomen.m`
rungephaenomen

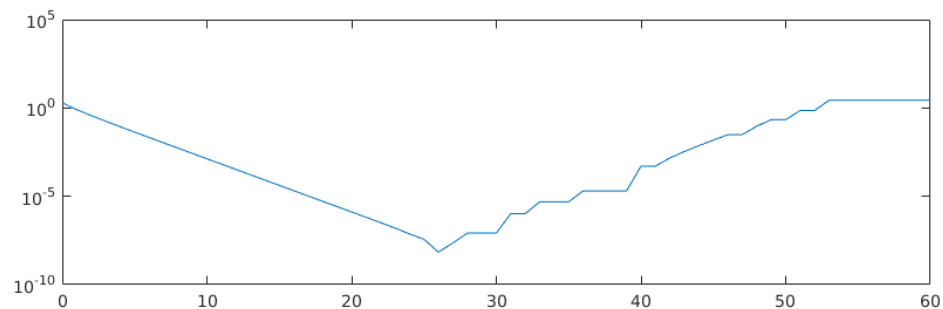
```
1  f = inline('1./(1+25*x.^2)','x');
2  p = 9;
3  j = 0:1:p-1;
4
5  t = cos((2*j+1)./(2*p)*pi); %Chebyshev-Knoten [-1,1]
6
7  a = -1;
8  b = 1;
9
10 %t=1/2*(a+b)-tmp*(b-a)/2;
11
12 xj = a + (b-a).*j./(p-1); %aeuqidistante Knoten in [-1,1]
13
14 y = linspace(a,b);
15 fy = f(y);
16
17 fxj = f(xj);
18 ft = f(t);
19
20 pxj = newtonIntpol(xj,fxj,y);
21 pt = newtonIntpol(t,ft,y);
22
23 plot(y,fy,y,pxj,'r-',xj,f(xj),'ro',y,pt,'k-',t,f(t),'ko')
24
25 legend('f','Aequidistant','Aequidistant','Chebyshev','Chebyshev');
26
```



Aufgabe 10.50

```
dbtype aufgabe1050.m
aufgabe1050
```

```
1
2     x0 = 1;
3     j = (0:1:60)';
4     h = 2.^(-j);
5     yprime = (exp(x0+h) - exp(x0))./h;
6
7     err = abs(yprime-exp(x0));
8
9     semilogy(j,err);
10
11    [errmin,I] = min(err);
12
13    fprintf('h=%e=2^(-%d) fuer den kleinsten Fehler.\n',h(I),j(I));
h=1.490116e-08=2^(-26) fuer den kleinsten Fehler.
```



Aufgabe 10.52

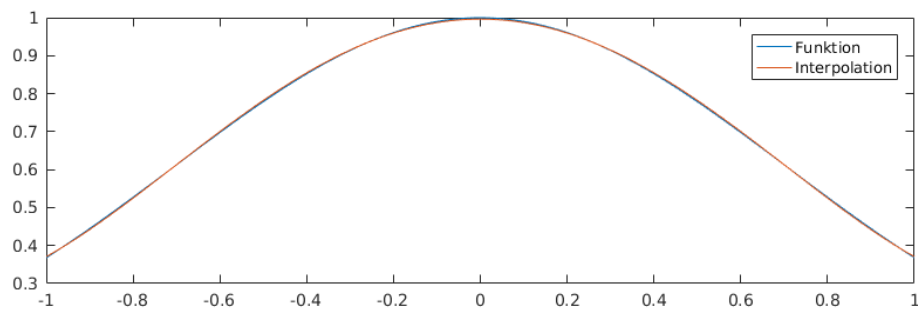
```
dbtype aufgabe1052.m
aufgabe1052
```

```
1     n = 5;
2
3     % Interpolationspolynom mit Chebyshev bestimmen
4     j = 0:n;
5     x = cos((2*j+1)*pi/(2*(n+1)))';
6     f = exp(-x.^2);
7     [J,X] = meshgrid(j,x);
8     V = X.^J;
9     p = V\f;
10
11    % Interpolationspolynom auf feinem Gitter auswerten
12    xx = (-1:0.01:1)';
13    ff = exp(-xx.^2);
14    [J,XX] = meshgrid(j,xx);
```

```

15  VV = XX.^J;
16  pp = VV*p;
17
18  % Plot mit Fehler
19  plot(xx,ff,xx,pp)
20  legend('Funktion','Interpolation')
21
22  [y0,ix] = max(abs(ff-pp));
23  x0 = xx(ix);
24
25  x1 = roots([128,0,-1344,0,3360,0,-1680,0]);
26  x1 = x1(abs(x1)<=1);
27  x1 = [x1;-1;1];
28  fnmax = max(abs((64*x1.^6-480*x1.^4+720*x1.^2-120).*exp(-
x1.^2)));
29  res = fnmax/2^n/prod(1:(n+1));
30  fprintf('Maximaler Fehler:\n|(f-p%d)(%1.2f)| = %1.2e <= %1.2e
\n',n,x0,y0,res);
Maximaler Fehler:
|(f-p5)(0.00)| = 3.63e-03 <= 5.21e-03

```



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