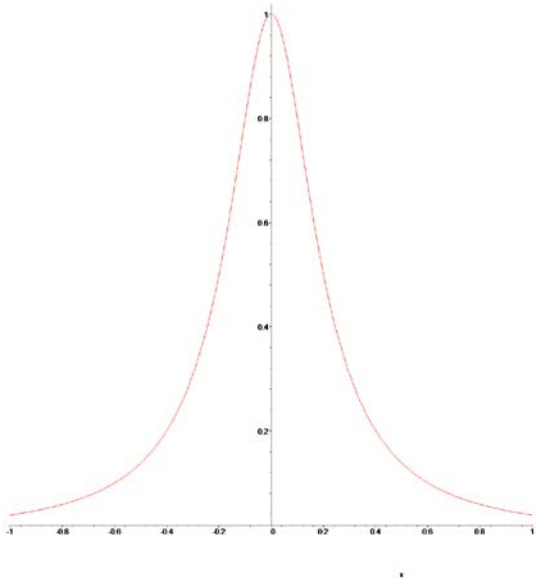
```
> f:= x-> 1/(1+25*x^2);
```

$$f := x \to \frac{1}{1 + 25\,x^2}$$

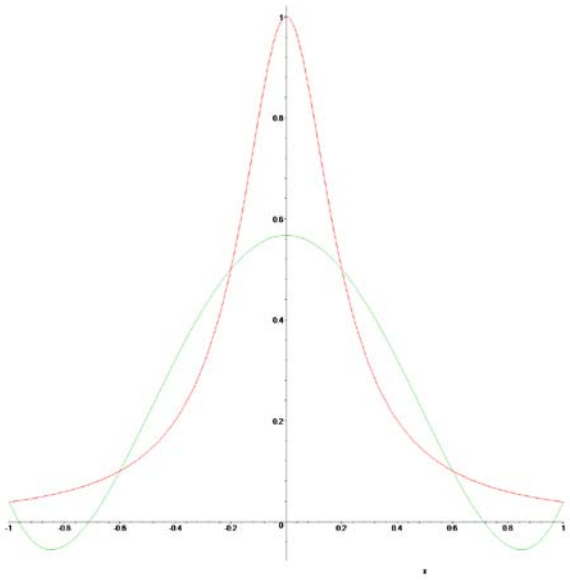
```
> plot(f(x),x=-1..1);
```



```
> n:= 5:
t:=Vector(n+1): g:= Vector(n+1):
for j from 1 to n+1 do
t[j] :=-1+(j-1)*2/n;
g[j] := f(t[j]);
od:
> with(CurveFitting):
I5:=unapply(PolynomialInterpolation(t,g,x),x);
```

$$I5 := x \to \frac{125}{104}\,x^4 - \frac{45}{26}\,x^2 + \frac{59}{104}$$

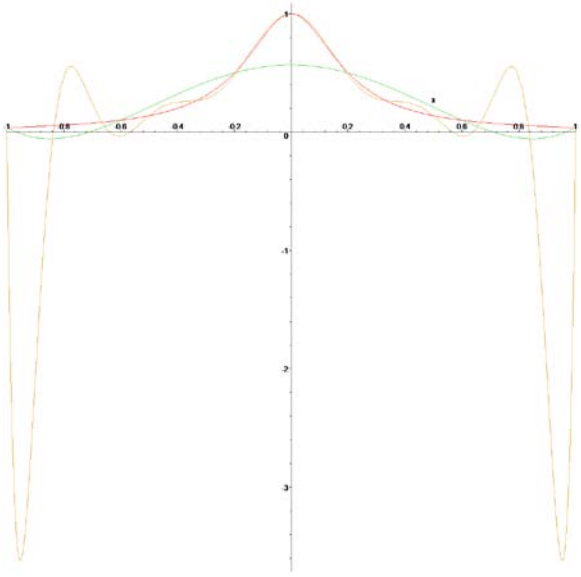
```
> plot({f(x),I5(x)},x=-1..1);
```



```
> n:= 12:
t:=Vector(n+1): g:= Vector(n+1):
for j from 1 to n+1 do
t[j] :=-1+(j-1)*2/n;
g[j] := f(t[j]);
od:
> with(CurveFitting):
I12:=unapply(PolynomialInterpolation(t,g,x),x);
```

$$I12 := x \to \frac{25628906250000}{28167484501}x^{12} - \frac{65809335937500}{28167484501}x^{10} + \frac{62017871484375}{28167484501}x^{8} - \frac{107641853578125}{112669938004}x^{6} + \frac{367051586875}{1847048164}x^{4} - \frac{551599221900}{28167484501}x^{2} + 1$$

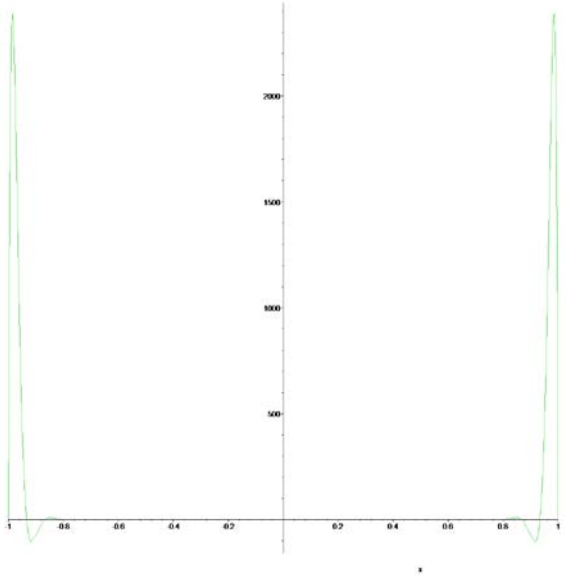
```
> plot({f(x),I5(x),I12(x)},x=-1..1);
```



Consider a 30 degree interpolating polynomial.

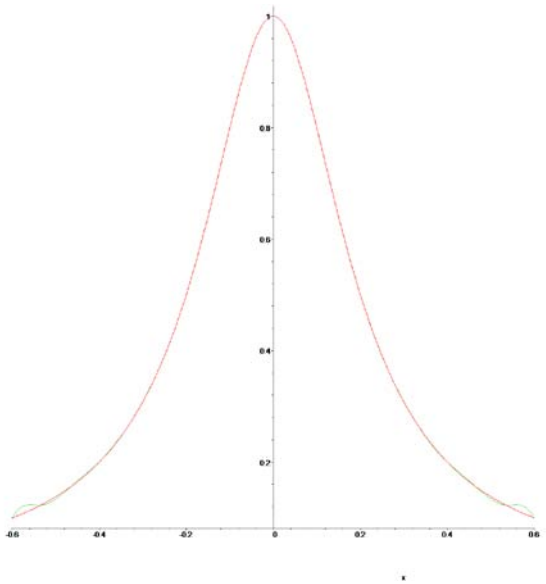
```
> n:= 30:
t:=Vector(n+1): g:= Vector(n+1):
for j from 1 to n+1 do
t[j] :=-1+(j-1)*2/n;
g[j] := f(t[j]);
od:
> I30:=unapply(PolynomialInterpolation(t,g,x),x);
> plot({f(x),I30(x)},x=-1..1);
```

$$I30 := x \to -\frac{78872316867845}{3163460487629}x^2 + \frac{320363204855132805}{534624822409301}x^4 - \frac{6712022502392748445}{534624822409301}x^6 - \frac{99656519081051945375}{41124986339177}x^{10} + \frac{8408705545976857840}{41124986339177}x^8 + 1 + \frac{6731327104959608578125}{328999890713416}x^{12} - \frac{809288714478915246093 75}{657999781426832}x^{14} + \frac{425764567870794377929 6875}{8050820855104768}x^{16} - \frac{223173552828115588623046875}{136863954536781056}x^{18} + \frac{378263794141864929199218 75}{10527996502829312}x^{20} - \frac{143425453748703002929 6875}{256780402508032}x^{22} + \frac{153082230403518676757 8125}{256780402508032}x^{24} - \frac{436347577580451965332 03125}{10527996502829312}x^{26} + \frac{230735869770526885986 328125}{136863954536781056}x^{28} - \frac{415657091259956359863 28125}{136863954536781056}x^{30}$$



Away from the ends it is a good fit.

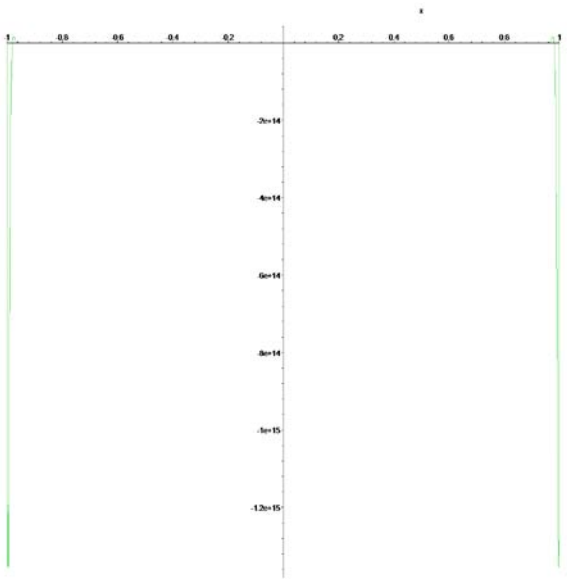
```
> plot({f(x),I30(x)},x=-0.6..0.6);
```



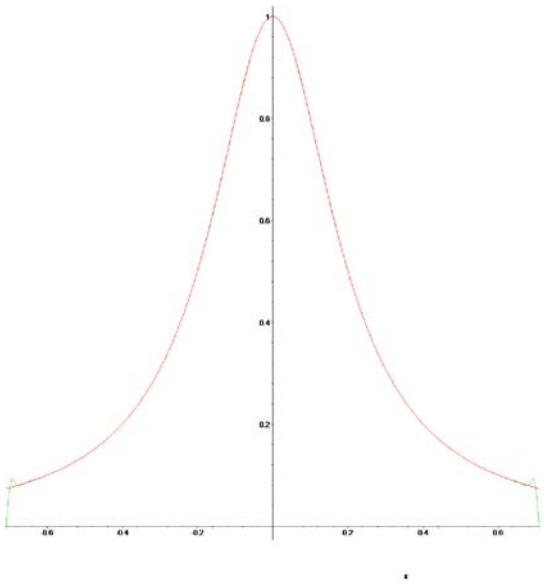
Higher degree interpolation is even worse near the boundary.

```
> n:= 100:
Digits:=120;
t:=Vector(n+1): g:= Vector(n+1):
for j from 1 to n+1 do
t[j] :=-1+(j-1)*2/n;
g[j] := f(t[j]);
od:
> I100:=unapply(PolynomialInterpolation(t,g,x),x):
> plot({f(x),I100(x)},x=-1..1);
```

Digits := 120



```
> plot({f(x),I100(x)},x=-0.71..0.71);
```


1
0.8
0.6
0.4
0.2
-0.6
-0.4
-0.2
0.2
0.4
0.6
x

>