Chapter 05.09
Choice of Points

After reading this chapter, you should be able to:

 1. *see how your choice of points affects interpolation.*

Example

Peter: "Dr. Kaw, in the last class you showed us that higher order interpolation is a bad idea. But when you took equidistant points between [-1,1] to approximate the function $f(x) = 1/(1 + 25x^2)$, it seemed that as you increased the number of points for approximation, the approximation was getting closer for the range of [-0.5,0.5].

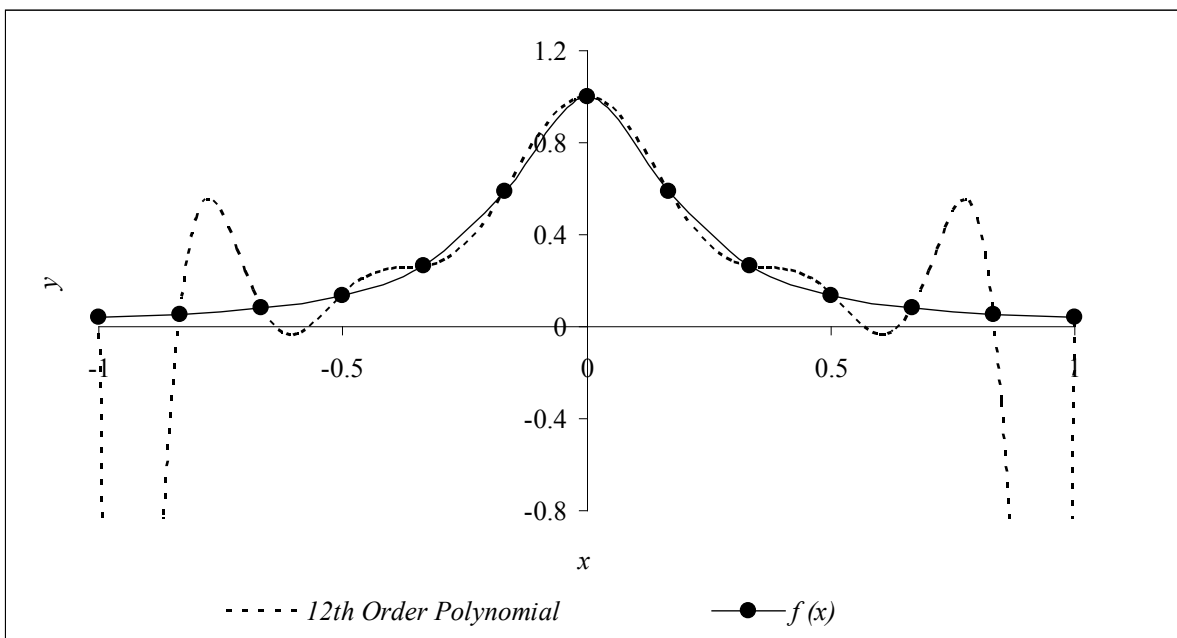**Figure 1** 12th order polynomial interpolation with equidistantly spaced points

Kaw: "But it did give highly oscillatory results outside that range. In Figure 1, you are approximating the function by a 12th order polynomial (dash curve), and it matches the original function (continuous curve) very well between [-0.5, 0.5].

Peter: "What if we choose more points close to the end points?"

Kaw: "You are on to something. Yes, it would make a difference and Runge found that if you choose more points close to the ends, you do get a better approximation. Let us choose points not equidistantly but closer to the ends. You can see in Figure 2, how much closer the 12th order polynomial (dash curve) is to the original function (continuous curve). This is not to say that this choice of points will work for every case. The choice of points is dependent on the value of the possible derivatives of a function, but this concept is beyond the scope of the course."
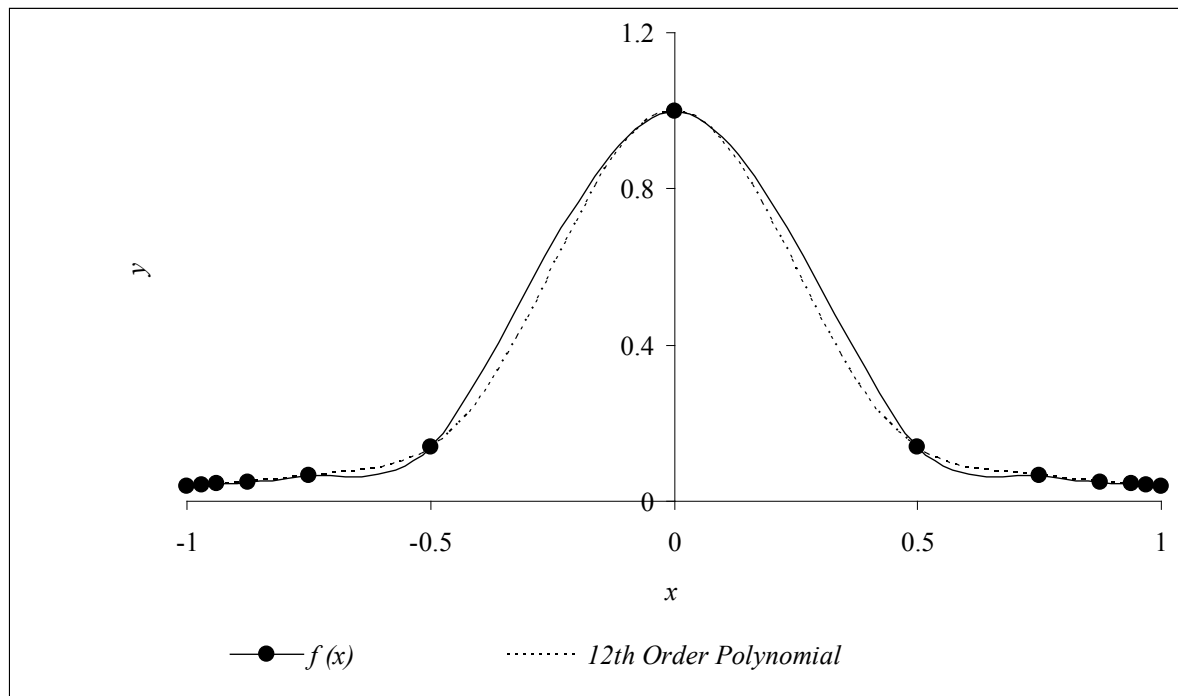

Figure 2 12th order polynomial interpolation with more point at the end

INTERPOLATION	
Topic	Choice of points affects interpolation
Summary	Textbook notes on how your choice of points can affect interpolation.
Major	All majors of engineering
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Last Revised	October 29, 2012
Web Site	http://numericalmethods.eng.usf.edu