Updated on November 18, 2021

Hints for Homework 10

1. (Polynomial vs. piecewise polynomial interpolation; **FNC** 5.1.2) See example codes in the live scripts accompanying Lecture 30.

2. (Piecewise cubic interpolation; **FNC** 5.1.3) Use either `interp1` (with `'spline'` option) or `spline`, both of which carry out the *not-a-knot* cubic spline. There are many other variations of piecewise cubic interpolation in MATLAB, but please stick with what was shown in class.

   If you feel inclined, use the textbook code `myspline` and `myspline_val` included in Lecture 32 live script.

3. (Quadratic interpolant by hand; **FNC** 5.1.4) The interpolant $q(x)$ is written in so-called *Lagrange polynomial form*. This interpolant is useful later in the discussion of finite difference formulas or numerical integration methods, especially in the derivation of the second-order centered difference formula or the Simpson's method.

   For part (b), look for a function $x = \phi(t)$ such that

   $$\begin{aligned} \phi(x_0 - h) &= -1 \\ \phi(x_0) &= 0 \\ \phi(x_0 + h) &= 1 \end{aligned} \tag{1}$$

   (Finding this function ϕ is what is meant by a *change of variable*.) Then compose it with $q(x)$ appropriately to obtain the desired interpolant p. Confirm that the outcome indeed interpolates the three points.

4. (Cardinal cubic splines; **FNC** 5.3.5) It was demonstrated in a lecture.

5. (Piecewise quadratic interpolation; adapted from **FNC** 5.3.6.) It was briefly discussed in a lecture.

6. (Cubic splines in 2-D) Check out the tutorial video on this topic, which is found in Week 13 supplementary videos page.