TABLE PT5.3 Specific study objectives for Part Five.

1. Understand the fundamental difference between regression and interpolation and realize why confusing the two could lead to serious problems
2. Understand the derivation of linear least-squares regression and be able to assess the reliability of the fit using graphical and quantitative assessments
3. Know how to linearize data by transformation
4. Understand situations where polynomial, multiple, and nonlinear regression are appropriate
5. Be able to recognize general linear models, understand the general matrix formulation of linear least squares, and know how to compute confidence intervals for parameters
6. Understand that there is one and only one polynomial of degree n or less that passes exactly through $n + 1$ points
7. Know how to derive the first-order Newton's interpolating polynomial
8. Understand the analogy between Newton's polynomial and the Taylor series expansion and how it relates to the truncation error
9. Recognize that the Newton and Lagrange equations are merely different formulations of the same interpolating polynomial and understand their respective advantages and disadvantages
10. Realize that more accurate results are generally obtained if data used for interpolation is centered around and close to the unknown point
11. Realize that data points do not have to be equally spaced nor in any particular order for either the Newton or Lagrange polynomials
12. Know why equispaced interpolation formulas have utility
13. Recognize the liabilities and risks associated with extrapolation
14. Understand why spline functions have utility for data with local areas of abrupt change
15. Recognize how the Fourier series is used to fit data with periodic functions
16. Understand the difference between the frequency and time domains