

Exam # 1 — Matlab Component
Linear Algebra
David Arnold
Fall 1998

Instructions. *Follow directions explicitly. You can work more efficiently if you use Matlab's editor to create script files, but this is not required.*

The goal in this Matlab component of your first examination is to find at least two fourth degree interpolating polynomials that pass through the points $(-3, 4)$, $(-1, -3)$, $(3, 1)$, and $(4, -1)$. That is, you need to find two polynomials of the form $y = ax^4 + bx^3 + cx^2 + dx + e$ that pass through the given points.

1. On a sheet of notebook paper, set up four equations in four unknowns that model the problem situation.
2. On the same sheet of notebook paper, clearly state the augmented matrix for the system of equations developed in question (1).
3. Enter the augmented matrix in question (2) into Matlab. Set Matlab to use rational arithmetic by entering `format rat` at the Matlab prompt. Use Matlab's `rref` command to transform the augmented matrix into reduced row echelon form. Clearly state this result on your notebook paper containing the answers to questions (1) and (2).
4. On your notebook paper containing the answers to questions (1)–(3), clearly state the system of equations represented by the reduced row echelon form of the augmented matrix found in question (3).
5. On your notebook paper containing the answers to questions (1)–(4), state the solution of the system of equations developed in question (1). State your answer in parametric form, using β for your free parameter.
6. Create a Matlab plot that shows the data points as little circles. On this plot, superimpose the plots of the interpolating polynomial for $\beta = 1$ and $\beta = -1$. Use the domain $[-3.2, 4.2]$ when plotting the interpolating polynomials.
7. Use `xlabel`, `ylabel`, and `title` to label the axes and provide an appropriate title for the plot in question (6).
8. Use the `gtext` command to label each polynomial with its equation.