

AM 147: Computational Methods and Applications: Winter 2023

Homework #5

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Due: February 15, 2023

NOTE: Please submit your Homework as a single zip file named `YourlastnameYourfirstnameHW5.zip` via CANVAS. For example, `HalderAbhishekHW5.zip`. Please strictly follow the capital and small letters in the filename of the zip file you submit. You may not receive full credit if you do not follow the file-naming conventions. Your zip file should contain all .m files (MATLAB scripts) for the questions below.

Your zip file must be uploaded to CANVAS by 11:59 PM Pacific Time on the due date. The uploads in CANVAS are time-stamped, so please don't wait till last moment. Late homework will not be accepted.

Problem 1

Solving square linear system

(50 points)

Write a MATLAB code with filename `YourlastnameYourfirstnameHW5p1.m` that finds the rational function

$$f(t) = \frac{p_1 + p_2 t + p_3 t^2}{1 + q_1 t + q_2 t^2}$$

satisfying the following conditions:

$$f(1) = 2, \quad f(2) = 5, \quad f(3) = 9, \quad f(4) = -1, \quad f(5) = -4.$$

To do so, you need to reformulate the problem as that of solving a square linear system of the form $\mathbf{A}\mathbf{x} = \mathbf{b}$ for a vector \mathbf{x} defined in terms of p_1, p_2, p_3, q_1, q_2 , and the appropriate \mathbf{A}, \mathbf{b} . Then solve the system in your MATLAB code using $\mathbf{A} \backslash \mathbf{b}$.

In the same code (same file), make a plot of t (in the horizontal axis) versus $f(t)$ (in the vertical axis) for $t \in [-6, 6]$, i.e., a plot of the computed rational curve.

Please only submit your code. You do not need to submit any hand calculations that you may do for setting up the appropriate \mathbf{A}, \mathbf{b} .