

Reading Assignment

Read Chapters 17 and 18

Problem #1: Linear Regression

Given the following set of measured data:

x	f(x)
-0.42	4.33
0.57	2.54
2.77	0.26
4.02	-3.24
5.65	-5.17
6.08	-8.15
7.53	-10.12
9.25	-12.22
9.30	-14.87

Implement linear regression in MATLAB to fit these points to a straight line of the following form. Show all of your work, including the intermediate matrices and column vectors. Do NOT use any built-in curve fitting functions in MATLAB.

$$f(x) = a - bx \quad 0 \leq x \leq 10$$

Report your calculated values of a and b . On the same plot, show your fitted line as well as the measured data within the specified interval. Be sure the plot is clear, professional, and “publication ready.” Attach a completed graphics checklist to this homework.

Problem #2: Nonlinear Regression

Given the following set of measured data:

x	f(x)
-0.14	-1.99
0.27	-4.66
1.09	-5.44
1.59	-4.38
2.22	-1.93
2.44	1.42
3.01	4.14
3.67	5.36
3.77	4.65
4.28	2.74
5.01	-0.49
5.59	-3.31
5.75	-4.97

Implement nonlinear regression in MATLAB to fit these points to a cosine function of the following form. Show all of your derivations. Do NOT use any built-in curve fitting functions in MATLAB.

$$f(x) = A \cos(\omega x + \phi) \quad 0 \leq x \leq 6$$

Report your calculated values of A , ω , and ϕ . On the same plot, show your fitted curve as well as the measured data within the specified interval. Be sure the plot is clear, professional, and “publication ready” as described in the course syllabus. Attached a graphics checklist to the end of this homework.

Problem #3: Interpolation

The following points were derived from a very accurate model.

<u>x</u>	<u>y</u>
-0.5	0
0	1.0
0.5	1.0
1.0	-3.0

Fit these points to a third-order polynomial and report the coefficients.

Use interpolation to calculate $y(-0.25)$ and $y(0.75)$.

Use extrapolation to calculate $y(-1.0)$ and $y(2.0)$.

Solve this problem by hand. Do NOT use MATLAB except to calculate one matrix inverse. Show all work.