06/10/2013

MSc. Applications of Mathematics

Linear Algebra - Homework 9

(Due on 14/10/2013 at 10:30 a.m.)

Instructions:

- Solutions must be complete and legible in order to earn maximum points.
- You may discuss and work together if necessary but you must write your own solutions. Copied solutions (from each other or books or the internet) are easy to identify and easier to grade as they can only earn a zero.

1. Say whether the following statements are true or false providing justification for each.
   (a) The residual vector $r = b - Ax$ is orthogonal to range(A) at the solution to the least squares problem $Ax \approx b$.
   (b) If b lies in range(A) then the residual vector r is zero.
2. Is the least squares solution for the problem corresponding to the three data points $(x_i, y_i) = (0.0), (1, 0), (1, 1)$ unique? Why or why not?
3. Consider the data in the following table:

x_i	1	2	4	5
y_i	2	3	5	6

   Find the least squares polynomial of degree 2 that fits this data by:
   (a) solving the normal equations;
   (b) using QR decomposition.