

Math1204 Test 4

March 20th 2013

Answer all questions and give complete reasons and checks for your answers. Please do not erase anything, just put a line through your work and continue; you cannot lose marks for anything you write. The questions are weighted as shown and can be answered in any order.

1. (a) Find the best fit straight line to this data using the matrix method. [5]

x_j	-4	-2	-1	0	2
y_j	0	3	1	4	2

- (b) Find the differences between the data points and the points directly above or below them on the line and check that the sum of these differences is zero. Explain, in general what you believe is the minimum number of points that could exist that are on one side of a best fit line and how this could happen. [3]

2. In this question we will be considering the recurrence $b_{n+1} := 4b_n + 7b_{n-1} - 10b_{n-2}$ and the initial values are given to be $b_0 = 42$, $b_1 = -120$ and $b_2 = 120$.

- (a) Give the polynomial (without necessarily doing a co-factor expansion) that the eigenvalues of the underlying matrix must satisfy. Use trial substitution and plot a graph of your polynomial to find the three eigenvalues (which are integers). [3]
- (b) State the eigenvectors and then use diagonalisation to find the general solution for b_k dealing with the inverse in whichever way you wish (apart from copying it from your calculator!). [7]
- (c) Give a possible set of values for b_0 , b_1 and b_2 which will give negative values for b_k for $0 \leq k \leq 4$ but from that point on the values of b_k will alternate positive and then negative, explaining how you are utilising the eigenvalues. [2]