MAU11S02 Group A1 Quiz 07 9am 20/3/19

Rules and procedures.
1. Answers must be handed up at the end of the tutorial, no other time. **2.** Attempt 3 questions. Only *your first three answers* will be marked. **3.** Each question carries 10 marks, so the maximum quiz mark is 30. **4.** Marked quizzes will be returned, and answers published, the following week. **5.** If a particular method of solution is stipulated, you get no marks if you don't use it. **6.** The (9) quizzes will contribute 20% to your overall mark. **7.** You are allowed to collaborate and compare answers during the tutorial. **8.** ***Show all work.*** No marks will be given for answers which do not show the calculations.

Question 1. Given the points $(-2, 0), (0, 3), (1, 2), (2, 3)$, we need its least-squared error quadratic estimator $y = ax^2 + bx + c$.

Reduce the problem to a system of equations in three unknowns:

$$A^T A \begin{bmatrix} a \\ b \\ c \end{bmatrix} = A^T Y$$

Question 2. Hence find the quadratic least-squared-error estimate.

Question 3. Find the eigenvalues and corresponding eigenvectors for the following matrix

$$A = \begin{bmatrix} 7 & -4 \\ 5 & -2 \end{bmatrix}$$

Question 4. Hence calculate e^{At}, where A is as in question 3.

Question 5. Hence solve the system of differential equations

$$\frac{dx}{dt} = 7x - 4y; \quad \frac{dy}{dt} = 5x - 2y$$

where $x = 4$ and $y = -3$ at $t = 0$.