MAU11S02 seventh Friday quiz, week 9
Wednesday 29/3/21 due 1pm Friday 9/4/21

Rules and procedures.
1. Attempt 3 questions. Only *your first three answers* will be marked. **2.** Each question carries 20 marks, so the maximum quiz mark is 60. **3.** If a particular method of solution is stipulated, you get no marks if you don't use it. **4.** ***Show all work.*** No marks will be given for answers which do not show the calculations. **5.** Your answers should be scanned and submitted to Blackboard as a 'Friday assignment.'

Remember, you must show all work.

Question 1. Let

$$A = \begin{bmatrix} 12 & -10 \\ 15 & -13 \end{bmatrix}$$

(same as last week). Solve the differential equation

$$\frac{d}{dt}\begin{bmatrix} x \\ y \end{bmatrix} = A\begin{bmatrix} x \\ y \end{bmatrix},$$

with $x = 2$ and $y = -1$ at $t = 0$.

Question 2. Check that your solution $X = [x(t), y(t)]^T$ to the differential equation satisfies the initial conditions (evaluate $X(0)$), and check that it satisfies the differential equation by evaluating dX/dt and AX.

Question 3. X and Y are independent random variables following the distribution $B(3, 2/3)$. Calculate the distribution of the pairs (X, Y) $(0 \leq X, Y \leq 3)$.

Question 4. X and Y are independent random variables following the distribution $B(3, 2/3)$. Calculate the distribution of the random variable $X + Y$.

Question 5. Three (independent) trials are made out of a Binomial distribution $B(3, 3/5)$ which has two outcomes, R (red, probability 3/5) and G (green, probability 2/5).

Definition: Two events X, Y are *independent* if $P(X \cap Y) = P(X)P(Y)$.

Let A be the event 'two greens,' B 'first outcome is red,' and C 'Second is green.' Calculate the probabilities of $A, B, C, A \cap B, A \cap C$, and $B \cap C$. Determine whether A and B are independent, whether A and C are independent, and whether B and C are independent. (It helps to list the 8 outcomes and label them with their probability, and which of the events A, B, C they belong to.)