MAU11S02 Group A1 Quiz 04 9am 19/2/20

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 20 marks, so the maximum quiz mark is 60. **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.
Calculate bases for the row space, column space, and nullspace of the following matrix

$$\begin{bmatrix} -1 & -2 & -9 \\ 0 & 1 & 3 \\ -1 & -4 & -15 \end{bmatrix}$$

Question 2. Calculate a basis for the space of all linear combinations

$$\{\alpha_1(-1,0,-1) + \alpha_2(-2,1,-4) + \alpha_3(-9,3,-15) : \alpha_1, \alpha_2, \alpha_3 \in \mathbb{R}\}$$

Question 3. Calculate bases for the row and column spaces of the following matrix

$$\begin{bmatrix} 0 & -3 & -9 & -9 & -2 \\ 0 & 1 & 3 & 3 & 1 \\ -2 & 0 & -4 & -6 & 4 \\ 1 & 3 & 11 & 12 & 0 \end{bmatrix}$$

Question 4. Calculate a basis for the nullspace of the matrix in Question 3.

Question 5. Construct an orthonormal basis for $\mathbb{R}^2$ (column vectors) in which one vector is in the direction $(5, 12)$.