

MA 1111: Linear Algebra I
Homework problems for September 28, 2018

Solutions to this problem sheet are to be handed in after our class at 1pm on Friday. Please attach a cover sheet with a declaration

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confirming that you know and understand College rules on plagiarism. On the same cover sheet, please put your name, student number, and name of the degree (Maths/TP/TSM), and staple all the sheets together. (Failure to do that may result in misplaced/lost sheets, for which no responsibility can be taken by instructors.)

1. Find an equation for the plane (a) containing the point $(1, -1, 1)$ and perpendicular to the vector $\mathbf{n} = (1, -2, 1)$; (b) containing the points $(1, -1, 1)$, $(2, 3, -1)$, $(0, 2, 1)$. (*Hint:* to find a vector perpendicular to a plane, you can compute the vector product of two vectors in that plane.)

2. The system of equations

$$\begin{cases} 2x - y + 4z = 1, \\ 7x + 2y + z = 5 \end{cases}$$

defines a line \mathbf{l} in the 3d space (which is the intersection of the corresponding planes). Find a parametric equation of that line.

3. The 3×5 -matrix

$$\begin{pmatrix} 1 & 4 & 5 & 1 & 1 \\ 1 & 2 & 2 & 1 & -4 \\ 1 & 2 & 0 & 5 & -4 \end{pmatrix}$$

represents some system of linear equations. Write down that system of equations, and use elimination to describe its solution set.

4. How many solutions, depending on the parameters (\mathbf{a}, \mathbf{b}) , does the following system of equations have?

$$\begin{cases} x + 4ay = 1 - \mathbf{b}, \\ ax + y = \mathbf{b}. \end{cases}$$