Applied Mathematics I- Worksheet #6

September 22 - Professor Broughton

Name:_____ Box #:_____

1. Null space and the general solution

1.a Find A; x and b such that the system below is the same as $Ax = b$:

$$\begin{aligned} x + 2y + z + w &= 5 \\ 2x + 4y + z - w &= 6 \\ 3x + 2y + 4z + 5w &= 14 \end{aligned}$$

1.b Verify that $x_0 = \begin{bmatrix} 1 & 1 & 1 & 1 \end{bmatrix}^t$ $x_1 = \begin{bmatrix} 11 & 0 & -11 & 5 \end{bmatrix}^t$ are solutions to the equation, and that $x_1 - x_0$ is in the null-space of A :

1.c Write x_1 in the form $x_0 + h$; where h is in the null-space of A:

1.d Find the general solution of $Ax = b$ and write it in the form

$$x_0 + sh_0$$

where x_0 is as above and h_0 is in the nullspace of A.

2. Find the general solution to the equations on 23 of the book, reproduced here

$$\begin{aligned} Q_1 + Q_3 &= 5 \\ Q_1 - Q_2 - Q_5 &= 4 \\ Q_2 + Q_3 - Q_4 &= 0 \\ Q_4 + Q_5 &= 1 \end{aligned}$$

Write out the general solution as

$$x_0 + sh_0 + th_1$$

where x_0 is a particular solution and h_0 and h_1 are in the null-space of A: