Consider the following system of linear equations:

$$\begin{aligned} 2\,x_1 + 4x_2 + 6x_3 &= 6 \\ \mathrm{x}_1 + 3x_2 + 4x_3 &= 4 \\ \mathrm{x}_2 + ax_3 &= 1 \end{aligned}$$

(2 points) Find A and $\vec{b}$ such that the above system in the form $A\vec{x} = \vec{b}$ (i.e. an matrix equation).

(5 points) Explicitly showing *all* the steps row reduce the *augmented matrix* for the above system into echelon form.

(2 points) For which a does the augmented matrix have 3 pivots?

(4 points) Explicitly showing *all* the steps reduce the augmented matrix into reduce echelon form. (Hint: there are 2 cases.)

(2 points) Is there an a such that the system does not have a solution? Why or why not?

(5 points) Find the general solution to the above system (Hint: there are two cases).