Homework #10 (Extra problem): Consider the linear system

$$\mathbf{X}' = \begin{pmatrix} \alpha & 1 \\ -2 & -3 \end{pmatrix} \mathbf{X} + \begin{pmatrix} 5 \\ 10 \end{pmatrix}, \tag{1}$$

where α is a parameter.

(i) Find the particular solution $\mathbf{X_p}$. Answer should be in terms of α. Hint: You can try to use method of undetermined coefficients where the guess $\mathbf{X_p} = \boldsymbol{\xi}$ where $\boldsymbol{\xi}$, a constant vector, is to be determined by subsitution.

(ii) Find the range of the parameter α for which $\mathbf{X}(\mathrm{t}) \to \mathbf{X_p}$ as $t \to \infty$ for any initial condition $\mathbf{X}(0)$.