MS4328 Problem Sheet 8-b

1. Find the state transformation and feedback control that brings about the input-state linearisation of the system

$$\dot{\mathbf{x}} = \begin{pmatrix} x_2 \\ \sin x_1 + x_3 \\ -2x_2 - 5x_3 \end{pmatrix} + \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} u.$$

   Find a feedback control that stabilises the system.

2. Find the state transformation and feedback control that brings about the input-state linearisation of the system

$$\dot{\mathbf{x}} = \begin{pmatrix} 0 \\ \sin x_1 \\ \sin x_2 \end{pmatrix} + \begin{pmatrix} \cos x_3 \\ 0 \\ 0 \end{pmatrix} u.$$

   Where is the state transformation valid?

3. Apply the input-state linearisation algorithm to the LTI system

$$\dot{\mathbf{x}} = \begin{pmatrix} 1 & 0 & -1 \\ 0 & 0 & 1 \\ 1 & -2 & 3 \end{pmatrix} \mathbf{x} + \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} u.$$

   Hence or otherwise, find the linear state feedback that places the poles of the system at -1, -2, -3.
   What is the difference, if any, between this approach and the standard pole placement algorithm?