Due: Tuesday October 7, 2003 by 4:30pm in 145 KNNB.

Problem 1: Show that the following system is not input-state linearizable.
\[
\begin{align*}
    x_1 &= x_2 \\
    x_2 &= u_1 \\
    x_3 &= u_2 \\
    x_4 &= x_3 - x_3u_1
\end{align*}
\]

Problem 2: Consider the above system with the outputs:
\[
\begin{align*}
    y_1 &= x_1 \\
    y_2 &= x_4
\end{align*}
\]
(a) Show that a vector relative degree can be achieved by dynamic extension.
(b) Transform the system into the normal form.

Problem 3: Consider the following SISO system:
\[
\begin{align*}
    \dot{x} &= \begin{bmatrix} x_3 - x_2^3 \\ -x_2 \\ x_1^2 - x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u \\
    y &= x_1
\end{align*}
\]
(a) Show that the system has a globally defined normal form.
(b) Transform the system into the normal form.