Feedback Linearization

Consider the system
\[ \dot{x} = f(x) + g(x)u. \] (1)

Is there a state feedback control law
\[ u = \alpha(x) + \beta(x)v \]
(and potentially a change of variables \( z = Tx \)) that transforms (1) into an equivalent linear system? We will discuss this problem in conjunction with the following two systems:

(a)
\[
\begin{align*}
\dot{x}_1 &= x_2 \\
\dot{x}_2 &= -a(\sin(x_1 + \delta) - \sin \delta) - bx_2 + cu
\end{align*}
\]

(b)
\[
\begin{align*}
\dot{x}_1 &= a \sin x_2 \\
\dot{x}_2 &= -x_1^2 + u
\end{align*}
\]