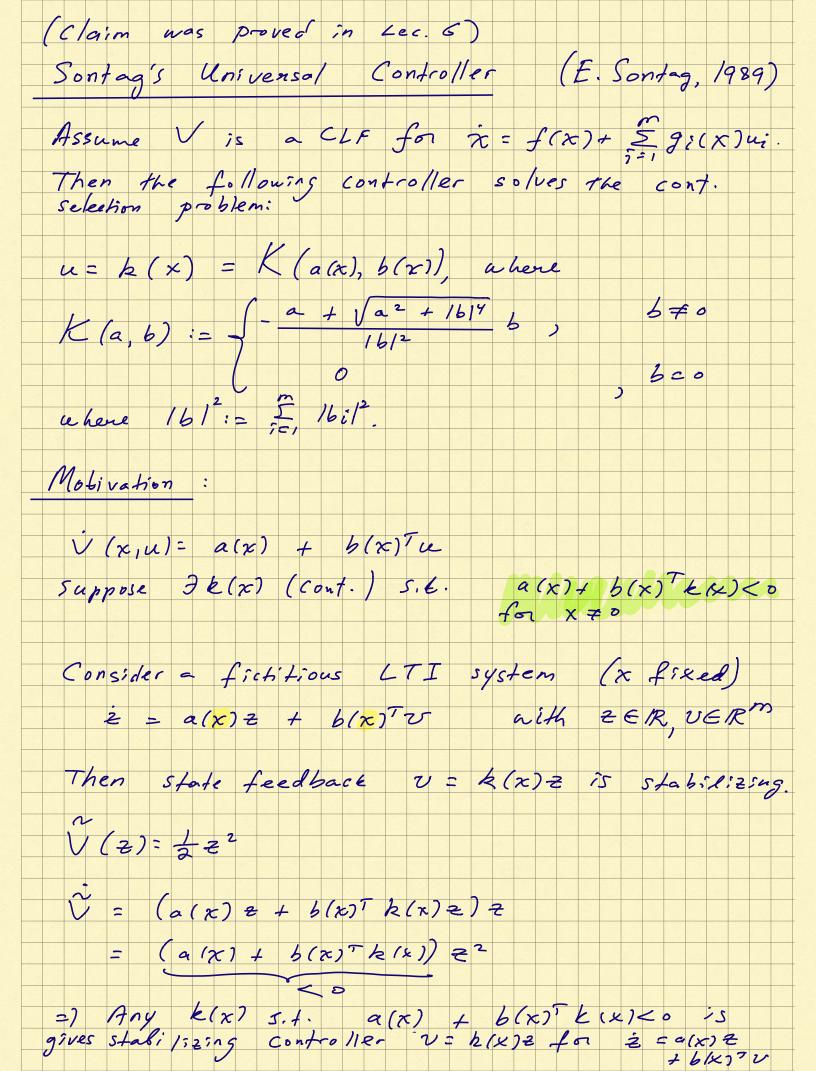


Question: does there exist a continuous stabilizing State Feedback law u=K(x) S.E. for all x # 0  $\frac{\partial v}{\partial x} f(x, k(x)) < 0$ and k(0)=0. CLF does not imply existence of such a k(x) in general. However, it does imply sol'n to continuous selection problem for systems -ffine in control  $\dot{x} = f(x) + \sum_{i=1}^{n} g_i(x)u_i$ CLF => 7 cont. stabilizing feedback u= k(x) Let U: Rn -) (0, 00) be given  $\dot{V}(x,u) = \partial V \left[ f(x) + \sum_{i=1}^{m} g_i(x) u_i \right]$  $= \frac{\partial V}{\partial x} f(x) + \frac{\mathcal{L}}{f(x)} \left( \frac{\partial V}{\partial x} g(x) \right) u_{i}^{2}$  $= \alpha(x) + b(x) \cdot u \qquad b(x) = \alpha(x) + b(x) \cdot u \qquad x \neq 0$   $= 0 \cdot (x) + b(x) \cdot u \qquad x \neq 0$ where  $a(x) := \frac{\partial V}{\partial x} f(x)$   $b(x) := \left( \frac{\partial V}{\partial x} g_{1}(x) \right)^{--}, \frac{\partial V}{\partial x} g_{m}(x) \right)^{--}$ 



Consider the following problem: Note: when 1b(x)/ 20, V has to be small (small control property) LOR (Linear Quadratic Regulator) problem: - solve Algebraic Riccati Equation (ARE)  $\frac{16(x)}{p^2} - \frac{2a(x)p}{-16(x)} = \frac{16(x)}{2} = \frac{16(x)}{2}$ for P>0 Then the optimal stab. controller is V= −p5(x) Z k(x) Solve the ARE (when /b(x)1 = 0): p= a(x) + Va2(x)+16/x)/4  $(b(x))^{2}$  $E_{xample}$ :  $\dot{x} = -x^3 + u$   $x_1 u \in \mathbb{R}$ construct a cont. stabilizing feedback law Several options:  $V(\chi): \frac{1}{2}\chi^2$  $- u = x^3 - x$  (feedback linearization)  $\dot{x} = -x$   $\dot{V} = -x^2 < \delta$ However: large control effort is needed when 1x1 is large

