UC Berkeley

EE128 Homework #1

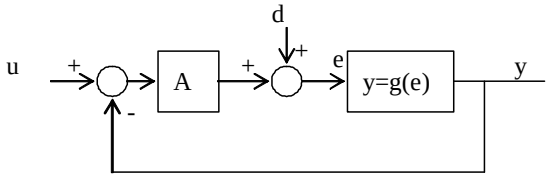
Due on Friday 9/23/05 8AM.

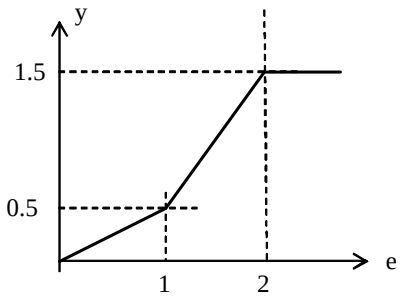
Consider the following feedback system where u is the input and y is the output.

(1) Let A=1. Sketchy the y vs. u graph and the y vs. d graph. The y-axis in your graph must cover the interval [0 2] and you must specify the coordinate of any 'break point' of the graph.

(2) Repeat (1) with A=20.

(3) Base on the graphs from (1) and (2), comment on the effect of the feedback gain A.





(2) Problem 2.20, part a and b. (Hint: i_a is the input and $r_1\omega_1 = \dot{x}_1$)

(3) Consider the nonlinear state equation. A state Xo is an equilibrium state of the system for a given u_o if

$$0 = F(X_o, u_o).$$

Note that the state vector X(t) stays constant if it is at an equilibrium state (i.e., X(t)=Xo for all t) since the rate of change of X is zero at this state.

(3.a) Find all the equilibrium states of the following system for u=0.
(3.b) Linearize the system about all the equilibrium states found above.

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} x_1(x_2 - 1) \\ x_2(2 - x_1) + u^2 \end{bmatrix}$$

(4) Problem 3.20 for the systems shown in diagram (a), (b), and (c) on page 187. No need to use Mason's rule.

(5) Problem 3.29