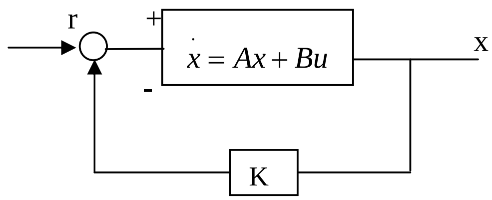
1. For a system that shown in Figure, with state equations bellow

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

determine the value of gain K so that the roots are $s_1 = -1, s_2 = -2$.



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2. For system described by differential equation, find its BIBO and zero input stability.

$$\dot{x} = x(t)$$
$$y(t) = 0.5x(t) + 0.5u(t)$$

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3. Consider the positive feedback that its impulse response was computed in bellow

$$g(t) = \sum_{i=1}^{\infty} a^i \delta(t-i)$$

Where the gain a can be positive or negative. Is this system BIBO stable or not.

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4. A negative feedback system has a loop transfer function :

$$G(s)H(s) = \frac{K_1(1+K_2 s)}{s(s+1)(s+2)}.$$

Find Variation $K_1 and K_2$ *for Closed Loop Stability.*

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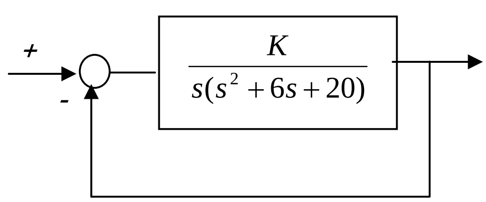
5. Find maximum value of gain k to put poles to left of axis a=-1



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6. A unity negative feedback control system has the plant

$$G(s) = \frac{k}{s(s+\sqrt{2k})}.$$

(a) Determine the percent overshoot and settling time (using a 2% settling criterion) due to a unit step input.

(b) For what range of K is the settling time less than 1 second?

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7. A negative feedback system has a loop transfer function:

$$G(s)H(s) = \frac{K(s+2)}{s(s-1)}.$$

(a) Find the value of the gain when the ξ of the closed-loop roots is equal to 0.707.

(b) Find the value of the gain when the closed-loop system has two roots on the imaginary axis.