

Due Tuesday, September 29

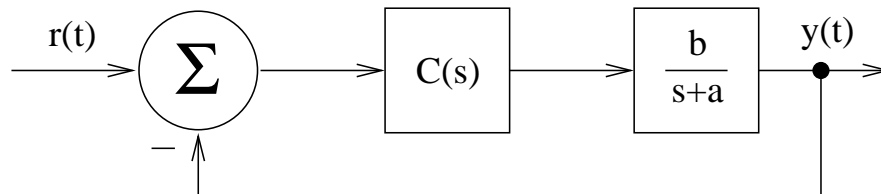
- Chapter 2, Problem 2.12
- Appendix B, Problem B.2 (a), (b), (d), (e), (f). [Hint:  $\sin(u \pm v) = \sin u \cos v \pm \cos u \sin v$  and  $\cos(u \pm v) = \cos u \cos v \mp \sin u \sin v$ .]

- A system with input  $u(t)$  and output  $y(t)$  is described by the following differential equation:

$$\ddot{y}(t) + 2\dot{y}(t) + 7y(t) = 3\dot{u}(t) + u(t).$$

Calculate the transfer function for this system,  $Y(s)/U(s)$ .

- Consider the following system, where  $a$  and  $b$  are positive real numbers:



Let  $C(s) = K_1$ , a positive real number.

- Compute the closed-loop transfer function,  $Y(s)/R(s)$ .
- If  $r(t)$  is a unit step input, compute the steady-state value of the output; that is, compute  $\lim_{t \rightarrow \infty} y(t)$ . [Hint: use the Final Value Theorem of Laplace transforms.]
- Repeat (a) and (b) for  $C(s) = K_2/s$ .
- Repeat (a) and (b) for  $C(s) = K_3 + K_4/s$ .