

**Homework #2**  
**ECE 551, Sp'08**  
**Due: Friday, April 11, 2008**

(1) E4.2

(2) P4.2

(3) For the PID controller discussed in class, with a plant,  $1/(s+1)$ , suppose that you want the closed-loop specifications (when  $w(t)=0$ ):

- Zero steady state tracking error to a unit step input on  $r(t)$
  - No overshoot to a unit step input on  $r(t)$
  - A rise time (time it takes to get from zero to 90% of a final value) due to a unit step input on  $r(t)$  of less than 1 sec.
- (a) Suppose that there is no derivative term or integral term. Tune the proportional controller to meet the specifications to the greatest extent possible.
- (b) Suppose that there is no derivative term. Tune the PI controller to meet the specifications.

Demonstrate via simulations the results of your designed controllers for both (a) and (b). Compare the results of (a) and (b).