

**Homework 3, ECE 1675/2595 Robotic Control, Spring 2022**  
**(Due Wednesday Feb. 16)**

**Problem 1.** Please read (a) Lecture 2 of ECE 1673, (b) Lecture 3 of ECE 2646, and (c) a supplemental note about classical PID control and submit a table summarizing the approximate amount of time that you spent in reading each document.

**Problem 2.** Consider a system represented by the differential equation

$$\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 3y(t) = 6r(t)$$

where the initial conditions are  $y(0) = 3$ ,  $\dot{y}(0) = 0$ , and  $r(t) = 1, t \geq 0$ . Please calculate the response  $y(t)$  for  $t \geq 0$ .

**Problem 3.** Consider a system represented by the transfer function

$$G(s) = \frac{4s + 2}{s^2 + 2s + 5}.$$

Please determine its natural frequency, damping ratio, and impulse response.