

## 24-352 DYNAMIC SYSTEMS & CONTROL

### HOMEWORK ASSIGNMENT # 6

DUE 2/28/01

#### PROBLEMS

From the textbook 7.10, 7.14, 7.34, 7.35

1. Suppose the displacement of a damped mass, spring system satisfies the equation

$$m y''(t) + B y'(t) + k y(t) = f_0 \delta(t)$$

where  $m = 1$ ,  $k = 100$ .

- a. If  $B = 10$  what are the poles of  $Y(s)$ ? Plot them in the complex  $s$  plane.
- b. Consider the pole in the 2<sup>nd</sup> quadrant. Draw a line from the origin to the pole. Determine the length of the line  $R$  and the angle of its intersection with the negative  $\text{Re}(s)$  axis. Use these values to determine the natural frequency and damping ratio of the system.
- c. Sketch two curves in the complex plane that show how the locations of poles change if  $B$  is increased from zero to 10.
- d. Plot the location of the poles if  $B = 30$ .