To be worked by Friday, 8/25:

1. Chapter 1, Problems 11, 14, 15

2. Assuming the system starts from rest, solve for the angular velocity as a function of time (i.e., \( \theta(t) \)) for the model described by the following differential equation:
   \[
   3\dot{\theta} + 9\theta = 18t
   \]

3. Consider a pulley with a mass moment of inertia of \( J \) and supported by two bearings that each have a (constant) coulomb friction torque \( T_f \) acting on the shaft. Assuming the pulley starts from an initial angular velocity of \( \omega_0 \):
   a) Solve for \( \omega(t) \)
   b) Sketch \( \omega(t) \)
   c) Sketch \( \theta(t) \)
   d) What is the final angular position of the pulley?

Supplemental Problems: Chapter 1 Problems 12, 13

4. Solve the following differential equations (for each state if they are linear/non-linear, homogenous/non-homogenous and identify the input, output, and eigenvalues). Assume the system starts from rest (IC = 0).
   a) \( m\ddot{y} + by = F \)
   b) \( 2\dot{x} + 4x = 6\sin(12t) \)
   c) \( 5\ddot{x} + 50\dot{x} = 10 \)

To be worked by Monday 8/28:

5. Work the following problems from Chapter 3: 5, 8-9, 12-13, 19, 28 (assume all pulleys have inertia \( J_p \) and radius \( R_p \)), 31, 39

6. A wheel attached to a linear damper rolls without slipping as shown. Assume the wheel starts from rest \( (\theta(0) = \dot{\theta}(0) = 0) \). Find the equation of motion.

Supplemental problems: Chapter 3 Problems: 10, 11, 20, 29, 34