1. A system defined by the following differential equation.

$$\ddot{y} + 2\dot{y} + 5y = x$$

Given the following input and initial conditions, find the output of the system by solving the differential equation.

$$x = \sin(3t) \qquad y(0) = 1 \qquad \dot{y}(0) = -1$$

2. For the following signals, find the final value of the signal as time approaches infinity.

   a. $X(s) = \dfrac{10s}{(s+1)(s+2)^2}$

   b. $Y(s) = \dfrac{10s}{s^2 + 2^2}$

   c. $Z(s) = \dfrac{5(s^2 - 2s + 4)}{s(s+1)(s+2)(s+3)}$

3. Determine the transfer function of the following systems.

   a. $\ddot{y} + 4\dot{y} + 4y = 2\dot{x} - x$

   b. $\ddot{v} + \dot{v} + 5v = x$
      $\dot{y} + y = 5v$

   c.