1.7-7)
  a) Causal, \( y(t) \) depends on the input two seconds ago.
  
  b) Noncausal, \( y(-2) = x(+2) \)
  
  c) Noncausal, \( y(1) = x(2) \) if \( a = 2 \).

1.7-8)
  a) Invertible, \( x(t) = \frac{dy}{dt} \)
  
  d) Invertible, \( x(t) = y(t/3 + 2) \)
  
  e) Noninvertible, If \( x(t) = X + n \, 2 \, \pi \), then \( y(t) = \cos(X) \)

1.8-2)
\[
\frac{d^2 y_1}{dt^2} + 2 \frac{dy_1}{dt} + 2 y_1 = \frac{d^2 x}{dt^2}
\]
\[
\frac{d^2 y_2}{dt^2} + 2 \frac{dy_2}{dt} + 2 y_2 = \frac{dx}{dt}
\]

1.8-5)
\[
\frac{dq_o}{dt} + \frac{R}{A} q_o = q_i
\]
\[
\frac{dh}{dt} + \frac{R}{A} h = \frac{1}{R} q_i
\]

2.2-2)
  a) Characteristic polynomial: \( Q(\lambda) = \lambda^2 + 4 \lambda + 4 \)
  Characteristic equation: \( \lambda^2 + 4 \lambda + 4 = 0 \)
  Characteristic roots: \( \lambda_1 = -2, \quad \lambda_2 = -2 \)
  Characteristic modes: \( c_1 e^{-2t}, \quad c_2 t e^{-2t} \)
  
  b) \( y_0(t) = 3 e^{-2t} + 2 t e^{-2t} \)
2.2-5)

a)  
Characteristic polynomial:  \( Q(\lambda) = \lambda^2 + 4\lambda + 13 \)
Characteristic equation:  \( \lambda^2 + 4\lambda + 13 = 0 \)
Characteristic roots:  \( \lambda_1 = -2 + j3, \quad \lambda_2 = -2 - j3 \)
Characteristic modes:  \( ce^{(-2+j3)t}, \quad c^* e^{(-2-j3)t} \)

b)  
\[ y_0(t) = 10 e^{-2t} \cos(3t - 60^\circ) \]

2.2-8)

a) No. The characteristic equation must have roots at -1 and 0.

b) Yes. This equation has roots at -1 and 0.

c) Yes. This equation has a double root at -1 and a root at 0. The initial conditions could be such that the coefficient of the \( t e^{-t} \) term is zero.