3.3 Find the Laplace $X(s)$ given that $x(t)$ is

(a) $2tu(t-4)$
(b) $5\cos t\ \ \delta(t-2)$
(c) $e^{-t}u(t-\tau)$
(d) $\sin 2t\ u(t-\tau)$

3.11 Obtain the inverse Laplace transform of the following functions:

(a) $X(s) = \frac{1}{s} + \frac{2}{s}e^{-s}$

(b) $Y(s) = \frac{10}{s^2 - 5s + 4}$

(c) $\frac{s-2}{s^2 + 2s + 10}$

3.14 Find the inverse Laplace transform of the following functions:

(a) $F(s) = \frac{20(s+2)}{s(s^2 + 6s + 25)}$

(b) $P(s) = \frac{6s^2 + 36s + 20}{(s+1)(s+2)(s+3)}$

3.18 Let $F(s) = \frac{5(s+1)}{(s+2)(s+3)}$

(a) Use the initial and final value theorems to find $f(0)$ and $f(\infty)$.

(b) Verify your answer in part (a) by finding $f(t)$ using partial fractions.

3.22 Find the transfer function of the system shown in Figure 3.24.

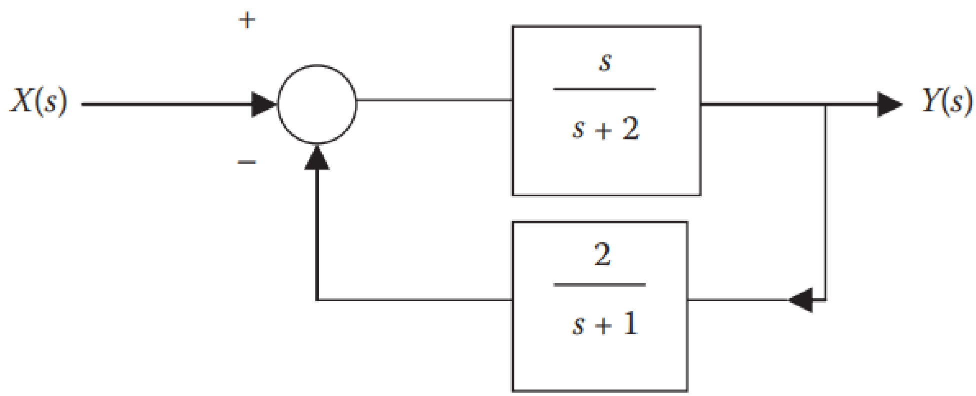

FIGURE 3.24 For Problem 3.22.

3.29 Solve the differential equation

$$y''(t) + 7y'(t) + 12y(t) = e^{-t}u(t)$$

subject to $y(0) = -1$, $y'(0) = 2$

3.46 Consider the function

$$H(s) = \frac{s^2 + 6s + 10}{s^3 + 7s^2 + 11s + 5}$$

Use the MATLAB residue function to obtain the inverse Laplace transform of $H(s)$.

3.50 Find the impulse response and the step response for each of the following systems:

(a) $H(s) = \dfrac{s+1}{s^2 + 5s + 6}$

(b) $H(s) = \dfrac{5s}{s^3 + 10s^2 + 10s + 4}$

3.51 Use MATLAB to find the zeros and poles of these functions:

(a) $$\frac{s-2}{(s+1)^2+9}$$

(b) $$\frac{s^2+2s+5}{s(s^2+4s+13)}$$

(c) $$\frac{s^2+10s+5}{s^3+4s^2+10s+6}$$

3.53 Obtain the Bode plots for the following transfer functions using MATLAB:

(a) $$H(s)=\frac{s(s+10)}{(s+20)(s+50)}$$

(b) $$H(s)=\frac{s+1}{(s+2)(s^2+22.5s+16)}$$