In Problems 1–30 use appropriate algebra and Theorem 7.2.1 to find the given inverse Laplace transform.

1.
$$\mathscr{L}^{-1}\left\{\frac{1}{s^3}\right\}$$

4.
$$\mathscr{L}^{-1}\left\{\left(\frac{2}{s}-\frac{1}{s^3}\right)^2\right\}$$

9.
$$\mathscr{L}^{-1}\left\{\frac{1}{4s+1}\right\}$$

10.
$$\mathscr{L}^{-1}\left\{\frac{1}{5s-2}\right\}$$

13.
$$\mathscr{L}^{-1}\left\{\frac{4s}{4s^2+1}\right\}$$

15.
$$\mathscr{L}^{-1}\left\{\frac{2s-6}{s^2+9}\right\}$$

16.
$$\mathscr{L}^{-1}\left\{\frac{s+1}{s^2+2}\right\}$$

17.
$$\mathscr{L}^{-1}\left\{\frac{1}{s^2+3s}\right\}$$

23.
$$\mathscr{L}^{-1}\left\{\frac{s}{(s-2)(s-3)(s-6)}\right\}$$

24.

$$\mathscr{L}^{-1}\left\{\frac{s^2+1}{s(s-1)(s+1)(s-2)}\right\}$$

27.

$$\mathscr{L}^{-1}\left\{\frac{2s-4}{(s^2+s)(s^2+1)}\right\}$$

In Problems 35–44 use the Laplace transform to solve the given initial-value problem.

41.

$$y'' + y = \sqrt{2}\sin\left(\sqrt{2}t\right), \quad y(0) = 10, \quad y'(0) = 0$$

42.

$$y'' + 9y = e^t, \quad y(0) = 0, \quad y'(0) = 0$$