

**13.28** Find  $f(t)$  if  $F(s)$  is given by the expression

$$F(s) = \frac{s(s+1)}{(s+2)^3(s+3)}$$

**SOLUTION:**

$$F(s) = \frac{K_1}{(s+2)^3} + \frac{K_2}{(s+2)^2} + \frac{K_3}{s+2} + \frac{K_4}{s+3}$$

$$K_1 = \frac{(-2)(-1)}{1} = 2 \quad K_4 = \frac{(-3)(-2)}{(-1)^3} = -6$$

$$\text{let } s = -1, \quad F(-1) = 0 = 2 + K_2 + K_3 - 3 \Rightarrow K_2 + K_3 = 1$$

$$\text{let } s = 0, \quad F(0) = 0 = \frac{2}{8} + \frac{K_2}{4} + \frac{K_3}{2} - 2 \Rightarrow K_2 + 2K_3 = 7$$

$$\text{yields } K_2 = -5 \text{ \& } K_3 = 6$$

$$F(s) = \frac{2}{(s+2)^3} - \frac{5}{(s+2)^2} + \frac{6}{s+2} - \frac{6}{s+3}$$

$$f(t) = \left[ t^2 e^{-2t} - 5t e^{-2t} + 6e^{-2t} - 6e^{-3t} \right] u(t)$$