

**13.22** Given the following functions  $F(s)$ , find  $f(t)$ .

$$(a) \quad F(s) = \frac{s^2 + 4s + 8}{(s + 1)(s + 4)}$$

$$(b) \quad F(s) = \frac{s + 4}{s^2}$$

**SOLUTION:**

$$a) \quad F(s) = \frac{s^2 + 4s + 8}{s^2 + 5s + 4} = 1 + \frac{4 - s}{(s + 1)(s + 4)} = 1 + \frac{K_1}{s + 1} + \frac{K_2}{s + 4}$$

$$K_1 = \frac{4 - (-1)}{3} = \frac{5}{3}$$

$$K_2 = \frac{4 - (-4)}{-3} = -\frac{8}{3}$$

$$F(s) = 1 + \frac{5/3}{s + 1} - \frac{8/3}{s + 4}$$

$$f(t) = \left[ s(t) + \frac{5}{3}e^{-t} - \frac{8}{3}e^{-4t} \right] u(t)$$

$$b) \quad F(s) = \frac{s + 4}{s^2} = \frac{K_1}{s^2} + \frac{K_2}{s} \quad K_1 = 4$$

$$\text{let } s = 1: \quad \frac{1 + 4}{(1)^2} = \frac{4}{(1)^2} + \frac{K_2}{(1)} \Rightarrow K_2 = 1$$

$$F(s) = \frac{4}{s^2} + \frac{1}{s}$$

$$f(t) = (4t + 1) u(t)$$