13.10 Given the following functions $\mathbf{F}(s)$, find $f(t)$.

(a) $\mathbf{F}(s) = \dfrac{4}{(s+3)(s+4)}$

(b) $\mathbf{F}(s) = \dfrac{10s}{(s+1)(s+6)}$

SOLUTION:

a) $F(s) = \dfrac{K_1}{s+3} + \dfrac{K_2}{s+4}$

$$\begin{cases} K_1 = \dfrac{4}{-3+4} = 4 \\ K_2 = \dfrac{4}{-4+3} = -4 \end{cases}$$

$$F(s) = \frac{4}{s+3} - \frac{4}{s+4}$$

$$\boxed{f(t) = (4e^{-3t} - 4e^{-4t})\,u(t)}$$

b) $F(s) = \dfrac{K_1}{s+1} + \dfrac{K_2}{s+6}$

$$\begin{cases} K_1 = \dfrac{-10}{-1+6} = -2 \\ K_2 = \dfrac{-60}{-5} = 12 \end{cases}$$

$$F(s) = \frac{-2}{s+1} + \frac{12}{s+6}$$

$$\boxed{f(t) = (12e^{-6t} - 2e^{-t})\,u(t)}$$