

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

$$(a) \quad F(s) = \frac{s(s+6)}{(s+3)(s^2+6s+18)}$$

$$(b) \quad F(s) = \frac{(s+4)(s+8)}{s(s^2+8s+32)}$$

SOLUTION:

$$a) \quad F(s) = \frac{s(s+6)}{(s+3)(s+3-j3)(s+3+j3)} = \frac{k_1}{s+3} + \frac{k_2}{s+3-j3} + \frac{k_2^*}{s+3+j3}$$

$$k_1 = \frac{(-3)(-3+6)}{(-3)^2 - 6(3) + 18} = -1 \quad k_2 = \frac{(-3+j3)(3+j3)}{(j3)(j6)} = 1 \Rightarrow k_2^* = 1$$

$$f(t) = [-e^{-3t} + 2e^{-3t} \cos(3t)] u(t)$$

$$b) \quad F(s) = \frac{k_1}{s} + \frac{k_2}{s+4-j4} + \frac{k_2^*}{s+4+j4} \quad k_1 = \frac{(4)(8)}{32} = 1$$

$$k_2 = \frac{j4(4+j4)}{(-4+j4)(j8)} = -j(1/2) = \frac{1}{2} \angle -90^\circ$$

$$f(t) = [1 + e^{-4t} \cos(4t - 90^\circ)] u(t)$$