13.41 Determine the initial and final values of $f(t)$ if $\mathbf{F}(s)$ is given by the expressions

(a) $\mathbf{F}(s) = \dfrac{2(s+2)}{s(s+1)}$

(b) $\mathbf{F}(s) = \dfrac{2(s^2+2s+6)}{(s+1)(s+2)(s+3)}$

(c) $\mathbf{F}(s) = \dfrac{2s^2}{(s+1)(s^2+2s+2)}$

CS

SOLUTION:

Initial values

a) $\lim_{s\to\infty} sF(s) = \lim_{s\to\infty} \frac{2(s+2)}{s+1} = \frac{2(\infty)}{(\infty)} = 2$ $\boxed{\lim_{t\to 0} f(t) = 2}$

b) $\lim_{s\to\infty} sF(s) = \lim_{s\to\infty} \frac{2(\infty^3)}{(\infty)^3} = 2$ $\boxed{\lim_{t\to 0} f(t) = 2}$

c) $\lim_{s\to\infty} sF(s) = \lim_{s\to\infty} \frac{2(\infty)^3}{\infty^3} = 2$ $\boxed{\lim_{t\to 0} f(t) = 2}$

final values

a) $\lim_{s\to 0} sF(s) = \lim_{s\to 0} \frac{2(s+2)}{(s+1)} = \frac{2(2)}{1} = 4$ $\boxed{\lim_{t\to\infty} f(t) = 4}$

b) $\lim_{s\to 0} sF(s) = \frac{2(6)(0)}{1(2)(3)} = 0$ $\boxed{\lim_{t\to\infty} f(t) = 0}$

c) $\lim_{s\to 0} sF(s) = 0$ $\boxed{\lim_{t\to\infty} f(t) = 0}$