EX: Find

$$\lim_{t\to\infty} f(t) \textit{ if } F(s) = \frac{3}{s[(s+4)^2+36]}$$

SOL'N: Apply the final value theorem:

$$\lim_{t\to\infty} f(t) = \lim_{s\to 0} s\mathcal{L}\{f(t)\} = \lim_{s\to 0} sF(s)$$

We first factor out the highest power of s from the numerator and denominator and cancel out as many powers of s as possible:

$$sF(s) = \frac{s}{s}\cdot\frac{3}{[(s+4)^2+36]} = \frac{3}{[(s+4)^2+36]}$$

If there are pure powers of s remaining in the numerator or denominator, we may immediately conclude that the answer is zero or infinity, respectively.

Otherwise, as in the present case, we proceed to substitute $s = 0$ in the numerator and denominator to obtain our final result:

$$\lim_{t\to\infty} f(t) = \lim_{s\to 0} sF(s) = \frac{3}{4^2+36} = \frac{3}{52}$$