Let $R(s) = \dfrac{P(s)}{Q(s)}$ be a rational function of s where $\deg P < \deg Q$. We can compute $\mathcal{L}^{-1}\{R(s)\}$ using the method of partial fractions.

Case 1 Q(s) has only nonrepeated linear factors.

Example Find $\mathcal{L}^{-1}\left\{\dfrac{s+11}{(s-1)(s+3)}\right\}$.

$$\frac{s+11}{(s-1)(s+3)} = \frac{A}{s-1} + \frac{B}{s+3}.$$

$$s+11 = A(s+3) + B(s-1)$$

$s=1$: $\quad 12 = 4A, \quad A = 3.$

$s=-3$ $\quad 8 = -4B, \quad B = -2.$ So

$$\frac{s+11}{(s-1)(s+3)} = \frac{3}{s-1} - \frac{2}{s+3}$$

$$\mathcal{L}^{-1}\left\{\frac{s+11}{(s-1)(s+3)}\right\} = 3\mathcal{L}^{-1}\left\{\frac{1}{s-1}\right\} - 2\mathcal{L}^{-1}\left\{\frac{1}{s+3}\right\}$$

$$= 3e^{t} - 2e^{-3t}.$$

In general, if $Q(s) = (s-r_1)(s-r_2)\cdots(s-r_n)$ where $r_1, r_2, \dots, r_n$ are all different then

$$\frac{P(s)}{Q(s)} = \frac{A_1}{s-r_1} + \frac{A_2}{s-r_2} + \cdots + \frac{A_n}{s-r_n}$$

for some constants $A_1, A_2, \dots, A_n$ when $\deg P < \deg Q$.