Example: Let $Y = \dfrac{s-1}{2s^2+8s+26}$. Find $\mathcal{L}^{-1}\{Y\}$.

$$Y = \frac{s-1}{2s^2+8s+26} = \frac{s-1}{2(s^2+4s+13)} = \frac{s-1}{2((s+2)^2+9)}$$

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

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

$$\mathcal{L}\{e^{-2t}\cos 3t\} = \frac{s+2}{(s+2)^2+3^2} \qquad (\#9 \text{ in Table})$$

$$\mathcal{L}\{e^{-2t}\sin 3t\} = \frac{3}{(s+2)^2+3^2} \qquad (\#8 \text{ in Table})$$

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

$$= \tfrac{1}{2}e^{-2t}\cos 3t - \tfrac{1}{2}e^{-2t}\sin 3t.$$