P8 # 33 of p. 375 (6th Ed. of NSS)

$F(s) = \ln\left(\frac{s+2}{s-5}\right)$, calculate $\mathcal{L}^{-1}\{F\} = f$
via the identity $\mathcal{L}^{-1}\left\{\frac{dF}{ds}\right\} = -tf$

$$f = \frac{-1}{t}\mathcal{L}^{-1}\left\{\frac{dF}{ds}\right\}, \quad F(s) = \ln(s+2) - \ln(s-5)$$

$$= \frac{-1}{t}\mathcal{L}^{-1}\left\{\frac{1}{s+2} - \frac{1}{s-5}\right\}$$

$$= \boxed{\frac{1}{t}\left(e^{5t} - e^{-2t}\right)}$$

P9 # 3 of p. 383

$y'' + 6y' + 9y = 0$, $y(0) = -1$, $y'(0) = 6$ Solve via Laplace

$$s^2 Y + s - 6 + 6(sY + 1) + 9Y = 0$$

$$(s^2 + 6s + 9)Y = 6 - s - 6 = -s$$

$$Y = \frac{-s}{s^2+6s+9} = \frac{-s}{(s+3)^2}$$

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

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

$$\therefore \mathcal{L}^{-1}\{Y\}(t) = \boxed{y(t) = -e^{-3t} + 3te^{-3t}}$$