1. $$\mathrm{X}(s)=\frac{s+2}{s(s+3)}=\frac{\frac{2}{3}}{s}+\frac{\frac{1}{3}}{s+3}=\frac{1}{3}\left(\frac{2}{s}+\frac{1}{s+3}\right)$$

$$\mathrm{x}(t)=\frac{1}{3}\left(2+e^{-3t}\right)\mathrm{u}(t)$$

2. $$\mathrm{X}(s)=\frac{s(s+2)}{(s+3)(s+1)}=\frac{s^2+2s}{s^2+4s+3}$$

This fraction is improper in *s*. Synthetically dividing the numerator by the denominator,

$$\mathrm{X}(s)=1-\frac{2s+3}{(s+3)(s+1)}=1-\left(\frac{\frac{3}{2}}{s+3}+\frac{\frac{1}{2}}{s+1}\right)=1-\frac{1}{2}\left(\frac{3}{s+3}+\frac{1}{s+1}\right)$$

$$\mathrm{x}(t)=\delta(t)-\frac{1}{2}\left(3e^{-3t}+e^{-t}\right)\mathrm{u}(t)$$

3. This function has a repeated root. Therefore the partial fraction expansion must contain the “$\frac{\ }{s}$” term in addition to the “$\frac{\ }{s^2}$” and “$\frac{\ }{s+1}$” terms.

$$\mathrm{X}(s)=\frac{5}{s^2(s+1)}=\frac{5}{s^2}-\frac{5}{s}+\frac{5}{s+1}=5\left(\frac{1}{s^2}-\frac{1}{s}+\frac{1}{s+1}\right)$$

$$\mathrm{x}(t)=5\left(t-1+e^{-t}\right)\mathrm{u}(t)$$