27. Reconstruct the time-domain function if its transform is (*a*) $\dfrac{\mathbf{s}}{\mathbf{s}(\mathbf{s}+2)}$; (*b*) 1; (*c*) $3\dfrac{\mathbf{s}+2}{(\mathbf{s}^2+2\mathbf{s}+4)}$; (*d*) $4\dfrac{\mathbf{s}}{2\mathbf{s}+3}$.

a) $\dfrac{\cancel{s}}{\cancel{s}(s+2)} = \dfrac{1}{s+2}$, $\mathcal{L}^{-1}\left\{\dfrac{1}{s+2}\right\} = \boxed{e^{-2t}u(t)}$

b) $\mathcal{L}^{-1}\{1\} = \boxed{\delta(t)}$

c) $3\dfrac{s+2}{s^2+2s+4} = 3\left[\dfrac{s+1}{(s+1)^2+3} + \dfrac{1}{(s+1)^2+3}\right]$

$f(t) = 3\mathcal{L}^{-1}\left\{\dfrac{s+1}{(s+1)^2+3}\right\} + \dfrac{3}{\sqrt{3}}\mathcal{L}^{-1}\left\{\dfrac{\sqrt{3}}{(s+1)^2+3}\right\}$

$= 3e^{-t}\cos\sqrt{3}t + \dfrac{3}{\sqrt{3}}e^{-t}\sin\sqrt{3}t$

$= \sqrt{3^2+\left(\frac{3}{\sqrt{3}}\right)^2}\, e^{-t}\cos\left(\sqrt{3}t - \tan^{-1}\left(\frac{3/\sqrt{3}}{3}\right)\right)$

$\boxed{= \sqrt{12}\, e^{-t}\cos\left(\sqrt{3}t - 30^\circ\right)}$

Note: this problem was more involved than intended. the book has a mistake → it meant for the denominator to be $s^2+4s+4 = (s+2)^2$.

d) Long division: $2s+3 \,\overline{)\, s}$ quotient $1/2$; $-s-3/2$; remainder $-3/2$

$4\dfrac{s}{2s+3} = 4\left[\dfrac{1}{2} - \dfrac{3}{2}\dfrac{1}{2s+3}\right]$

$f(t) = 2\mathcal{L}^{-1}\{1\} - 3\mathcal{L}^{-1}\left\{\dfrac{1}{s+3/2}\right\} = \boxed{2\delta(t) - 3e^{-3/2 t}u(t)}$