1. links: $-y(0) + s\,Y(s) + 3\,Y(s)$

rechts: $\dfrac{2}{s^2+4}$

2. $$Y(s) = \left(\frac{2}{s^2+4} + y(0)\right) \Big/ (s+3)$$

$$= \frac{2 + y(0)(s^2+4)}{(s^2+4)(s+3)}$$

$$\overset{!}{=} \frac{A + Bs}{s^2+4} + \frac{C}{s+3}$$ Partialbruchzerlegung

$$= \frac{As + 3A + Bs^2 + 3Bs + Cs^2 + 4C}{(s^2+4)(s+3)}$$

$$\begin{cases} 2 + 4y(0) = 3A + 4C & ((s^0)) \\ 0 = A + 3B & ((s^1)) \\ y(0) = B + C & ((s^2)) \end{cases}$$

$$\Longleftrightarrow \begin{pmatrix} 3 & 0 & 4 \\ 1 & 3 & 0 \\ 0 & 1 & 1 \end{pmatrix} \begin{pmatrix} A \\ B \\ C \end{pmatrix} = \begin{pmatrix} 2 + 4y(0) \\ 0 \\ y(0) \end{pmatrix}$$

$$\Longleftrightarrow \begin{cases} A = \dfrac{6 + 12y(0) - 12y(0)}{9+4} = \dfrac{6}{13} \\[2ex] B = \dfrac{4y(0) - 2 - 4y(0)}{13} = -\dfrac{2}{13} \end{cases}$$

$$C = \frac{9y(0)+2+4y(0)}{13} = y(0) + \frac{2}{13}$$

3. $$Y(s) = \frac{\frac{6}{13} - \frac{2}{13}s}{s^2+4} + \frac{y(0)+\frac{2}{13}}{s+3}$$

$$\Updownarrow$$

!

$$y(t) = \frac{3}{13}\sin(2t) - \frac{2}{13}\cos(2t) + \left(y(0)+\frac{2}{13}\right)e^{-3t}$$

4. allg. Lsg. der <u>homogenen</u> Form:

$$y(t) = D\,e^{-3t}$$

eine spez. Lsg. der <u>inhomogenen</u> Form:

Ansatz: $y(t) = E\sin(2t) + F\cos(2t)$

$$\Rightarrow y(t) = 2E\cos(2t) - 2F\sin(2t)$$

Einsetzen: $$2E\cos(2t) - 2F\sin(2t) + 3E\sin(2t) + 3F\cos(2t) \stackrel{!}{=} \sin(2t)$$

$$\Longleftrightarrow \begin{cases} 2E+3F=0 \\ 3E-2F=1 \end{cases} \Longleftrightarrow \begin{cases} E = \frac{-3}{-13} = \frac{3}{13} \\ F = \frac{2}{-13} = -\frac{2}{13} \end{cases}$$

$$\downarrow$$

Allg. Lsg der inh. Form:

$$y(t) = De^{-3t} + \frac{3}{13}\sin(2t) - \frac{2}{13}\cos(2t)$$

$$y(0) = D - \frac{2}{13} \Rightarrow D = y(0) + \frac{2}{13}$$

Damit dasselbe Resultat!