

1. $y_c(x) = C, y_p(x) = \frac{x^2}{2}$
2. $y_p(x) = \frac{2}{7}e^{4x}$
3. $y(x) = c_1e^{-x} + c_2xe^{-x} + c_3x^2e^{-x} + c_4x^2 \cos(x) + c_5 \sin(x) + c_6x \cos(x) + c_7x \sin(x)$
4. $D - 3$
5. $y(x) = c_1e^{3x} + c_2 \cos(2x) + c_3 \sin(2x)$
6. $G(s) = 3\frac{2}{s^3} - 5\frac{s-4}{(s-4)^2+3^2}$
7. proof in book
8. $g(t) = u(t-3)(t-3)^2; G(s) = e^{-3s} \frac{2}{s^3}$
9. $y(t) = 3e^{-5t}$
10. $Y(s) = \frac{1}{s^2-3s+1}(\frac{3s}{s^2+16} + 2s - 6)$
11. $f(t) = 3e^{-t} \cos(6t) - \frac{4}{3}e^{-t} \sin(6t)$
12. $y_p(t) = At \cos(2t) + Bt \sin(2t)$
13. $y' = z, z' = w, w' = -3w - z + 2y; \vec{x}' = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 2 & -1 & -3 \end{pmatrix} \vec{x}$
14. Yes. (plug and check)
15. Other eigenvalue and eigenvector: 2 and $\begin{pmatrix} 1 \\ -1 \end{pmatrix}$. Solution: $\vec{x}(t) = c_1e^{-3t} \begin{pmatrix} 4 \\ 1 \end{pmatrix} + c_2e^{2t} \begin{pmatrix} 1 \\ -1 \end{pmatrix}$
(or equivalent)
16. (a) $(0, 0)$ and $(0, 1)$.
(b) $< -\frac{1}{2}, -2 >$