1. $y(x) = \dfrac{C + \sin x}{1 + x}$

2. $y(x) = 2 \exp\left(-\dfrac{3}{2}x^2\right) + C \exp\left(-\dfrac{3}{2}x^2\right)\left(x^2+1\right)^{\frac{3}{2}}$

3. $y(x) = x^2 \sin x + Cx^2$

4. $y(x) = C_1 e^{2x} + C_2 e^{-2x} + \dfrac{1}{4}x \sinh(2x) - \dfrac{1}{16}\sinh(2x)$

5. $y(x) = C_1 \cos x + C_2 \sin x + \cos x \ln|\csc x + \cot x| - 1$

6. $y(x) = C_1 \cos x + C_2 \sin x + \cos x \ln|\sec x + \tan x| - \cos^2 x - \sin(2x)$

7. $\begin{pmatrix} x \\ y \end{pmatrix} = C_1 \begin{pmatrix} -\sin(3t) \\ \cos(3t) \end{pmatrix} e^{4t} + C_2 \begin{pmatrix} \cos(3t) \\ \sin(3t) \end{pmatrix} e^{4t}$

8. $\begin{pmatrix} x \\ y \end{pmatrix} = C_1 \begin{pmatrix} 2 \\ 1 \end{pmatrix} e^{5t} + C_2 \begin{pmatrix} 1 \\ -3 \end{pmatrix} e^{-2t}$

9. $\begin{pmatrix} x \\ y \end{pmatrix} = C_1 \begin{pmatrix} 3 \\ 2 \end{pmatrix} e^{4t} + C_2 \begin{pmatrix} 1 \\ -1 \end{pmatrix} e^{-t}$

10. All the eigenvalues, λ are $\lambda \geq 1$. For the eigenvalue $\lambda = 1$, the corresponding eigenfunction is $y(x) = xe^{-x}$. For eigenvalues $\lambda > 1$ one has $\lambda_n = 1 + \alpha_n^2$ where α_n is a root to the following equation $\tan\alpha = \alpha$. The corresponding eigenfunctions are $y_n(x) = e^{-x}\sin(\alpha_n x)$ for $\lambda > 1$.

11. All the eigenvalues, λ are $\lambda > 1$. For eigenvalues $\lambda > 1$ one has $\lambda_n = 1 + \pi^2 n^2$ where n is an integer. The corresponding eigenfunctions are $y_n(x) = e^{-x}\sin(\pi n x)$.

12. All the eigenvalues, λ are positive. When $\lambda > 0$ one has $\lambda_n = \alpha_n^2$ where α_n is a root to the following equation $\tan\alpha = -\alpha$. The corresponding eigenfunctions are $y_n(x) = \sin(\alpha_n x)$.

13. $x(t) = -\dfrac{1}{3}\cos t + \dfrac{1}{3}\cos(3t)$

14. $x(t) = \dfrac{1}{8}\cos t + \sin t - \dfrac{1}{8}\cos(3t)$

15. $x(t) = \dfrac{1}{9}e^{-t} - \dfrac{1}{9}e^{-2t}\cos(2t) + \dfrac{1}{18}e^{-2t}\sin(2t)$

16. $x(t) = \dfrac{C}{2}(\sin t - t\cos t)$

17. $x(t) = \dfrac{C}{6}t^3 e^{-t}$

18. $x(t) = \frac{C}{2} t^2 e^{-3t}$

19. $x(t) = \frac{1}{2} \sin(2t)$

20. $x(t) = \frac{1}{2} \sin(2t) + \frac{1}{2} \sin(2t - \pi) u(t - \pi)$

21. $\mathcal{L}\left(1 + [[t]]\right) = \dfrac{1}{s(1 - e^{-s})}$