

Selected answers Practice exam for Exam 3(no guarantee!), MATH 333, Fall, 2009

1. $y(t) = (2 - 2 \cos(t) - t \sin(t))e^t$
2. $y(t) = \frac{1}{4}(e^t - e^{-t} - 2te^{-t}) - \frac{e}{4}(e^{t-1} - e^{-(t-1)} - 2(t-1)e^{-(t-1)})U(t-1)$
3. $\mathcal{L}\{f(t)\} = \frac{s-1+2e^{-2s}-e^{-4s}-se^{-4s}}{s^2(1-e^{-4s})}$
4. $\mathcal{L}^{-1}\left\{\frac{2s^2+s-4}{s^3-s^2-2s}\right\} = 2 + e^{2t} - e^{-t}$ and $\mathcal{L}^{-1}\left\{\frac{3s+4}{(s+1)(s+2)^2}\right\} = e^{-t} - e^{-2t} + 2te^{-2t}$.
5. $\mathcal{L}\{e^{-t}(1+t^2)\} = \frac{1}{s+1} + \frac{2}{(s+1)^3}$ and $\mathcal{L}\{e^{-t}\sin^2(t)\} = \frac{1}{2}\left(\frac{1}{s+1} - \frac{s+1}{(s+1)^2+4}\right)$.
6. $y(t) = 2 + t^2$
7. $y(t) = -1 + 2e^t$
8. $q(t) = -85e^{-4t} + 95e^{-2t}$
9. solution set $\{(1+3t, -t, t) | t \text{ real}\}$
10. $\mathbf{A}^{-1} = \frac{1}{4} \begin{pmatrix} 3 & 1 & -1 \\ -1 & 1 & 3 \\ 1 & -1 & 1 \end{pmatrix}$
11. eigenvalues 1, 2, -1 with corresponding eigenvectors $\begin{pmatrix} 3 \\ 2 \\ 1 \end{pmatrix}, \begin{pmatrix} 1 \\ 3 \\ 1 \end{pmatrix}, \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}$.
12. system: $x'_1 = x_2, x'_2 = x_3, x'_3 = -e^t x_1 + t^2 x_2 - t x_3 + \sin(t)$, with initial values $x_1(0) = x_2(0) = 1$ and $x_3(0) = 0$.