

Exam 3

Math 217

This exam consists of 16 questions worth 5 points each. You must show all work. Answers without work will receive no credit. Do not leave answers in terms of convolutions.

1. Solve via Laplace transforms: $y'' + y = 8 \cos 3t$, $y(0) = 0$, $y'(0) = 0$.

2. Solve via Laplace transforms: $y'' + 4y' + 3y = 18t$, $y(0) = -9$, $y'(0) = 9$

3. Compute $\mathcal{L}\{g(t)\}$ for $g(t) = \begin{cases} 0 & t \leq 1 \\ t^3 & 1 < t \leq 2 \\ 0 & t > 2 \end{cases}$

4. Compute $\mathcal{L}^{-1}\left\{\frac{s^3+2s+5}{s^3-2s^2+5s}\right\}$

5. Show that $\sin 3t * \cos 3t = \frac{1}{2}t \sin 3t$.

6. Solve via Laplace transforms: $y'' + 9y = 3 \cos 3t$, $y(0) = 0$, $y'(0) = 0$

7. Solve $y'' + y = u_3(t) - u_0(t)$, $y(0) = 0$, $y'(0) = 0$

8. Solve $2y'' + 2y' + \frac{17}{2}y = \delta(t - 3)$, $y(0) = 1/2$, $y'(0) = -1/4$

9. Solve $\vec{x}' = \begin{pmatrix} 1 & 6 \\ 5 & 2 \end{pmatrix} \vec{x}$

10. Solve $\vec{x}' = \begin{pmatrix} 1 & 2 \\ -2 & 1 \end{pmatrix} \vec{x}$

11. Solve $\vec{x}' = \begin{pmatrix} -3 & -2 \\ 2 & -7 \end{pmatrix} \vec{x}$

12. Solve $\vec{x}' = \begin{pmatrix} 47 & 0 \\ 0 & 2 \end{pmatrix} \vec{x}$

13. Solve $\vec{x}' = \begin{pmatrix} 1 & 1 \\ 2 & 0 \end{pmatrix} \vec{x}$, $\vec{x}(0) = \begin{pmatrix} 2 \\ 2 \end{pmatrix}$

14. Solve $\vec{x}' = \begin{pmatrix} 3 & 1 \\ 1 & 3 \end{pmatrix} \vec{x}$, $\vec{x}(0) = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$

15. Solve $\vec{x}' = \begin{pmatrix} \frac{1}{2} & \frac{3}{2} \\ 1 & 1 \end{pmatrix} \vec{x} + \begin{pmatrix} 2e^t \\ 2t^2 \end{pmatrix}$.

16. Solve $\vec{x}' = \begin{pmatrix} 2 & -3 \\ 1 & -2 \end{pmatrix} \vec{x} + \begin{pmatrix} 3 \\ 1 \end{pmatrix} e^t \sec t$.