(1)

8. The solution of the system $\mathbf{X}' = \begin{pmatrix} 2 & 2 \\ 1 & 1 \end{pmatrix} \mathbf{X}$ is

Select the correct answer.

(a) $\mathbf{X} = c_1 \begin{pmatrix} -1 \\ 1 \end{pmatrix} + c_2 \begin{pmatrix} 2 \\ 1 \end{pmatrix} e^{-3t}$

(b) $\mathbf{X} = c_1 \begin{pmatrix} -1 \\ 1 \end{pmatrix} + c_2 \begin{pmatrix} 2 \\ 1 \end{pmatrix} e^{3t}$

(c) $\mathbf{X} = c_1 \begin{pmatrix} -1 \\ 1 \end{pmatrix} + c_2 \begin{pmatrix} 1 \\ 2 \end{pmatrix} e^{-3t}$

(d) $\mathbf{X} = c_1 \begin{pmatrix} -1 \\ 1 \end{pmatrix} + c_2 \begin{pmatrix} 1 \\ 2 \end{pmatrix} e^{3t}$

(e) none of the above

(2)

10. The solution of the system $\mathbf{X}' = \begin{pmatrix} -3 & -1 \\ 1 & -1 \end{pmatrix} \mathbf{X}$ is

Select the correct answer.

(a) $\mathbf{X} = c_1 \begin{pmatrix} -1 \\ 1 \end{pmatrix} e^{-2t} + c_2 \left[\begin{pmatrix} -1 \\ 1 \end{pmatrix} te^{-2t} + \begin{pmatrix} 1 \\ 0 \end{pmatrix} e^{-2t} \right]$

(b) $\mathbf{X} = c_1 \begin{pmatrix} -1 \\ 1 \end{pmatrix} e^{-2t} + c_2 \begin{pmatrix} -1 \\ 1 \end{pmatrix} te^{-2t} + c_3 \begin{pmatrix} 1 \\ 0 \end{pmatrix} e^{-2t}$

(c) $\mathbf{X} = c_1 \begin{pmatrix} -1 \\ 1 \end{pmatrix} e^{-2t} + c_2 \begin{pmatrix} 1 \\ -1 \end{pmatrix} e^{-2t}$

(d) $\mathbf{X} = c_1 \begin{pmatrix} -1 \\ 1 \end{pmatrix} e^{-2t} + c_2 \begin{pmatrix} 1 \\ 2 \end{pmatrix} e^{-t}$

(e) none of the above

(3)

11. The characteristic equation for the matrix $A = \begin{pmatrix} 3 & 0 & 0 \\ 0 & 1 & -1 \\ 0 & 1 & 3 \end{pmatrix}$ is

Select the correct answer.

(a) $-\lambda^3 - 7\lambda^2 - 16\lambda + 12 = 0$
(b) $-\lambda^3 + 7\lambda^2 + 14\lambda + 6 = 0$
(c) $-\lambda^3 + 7\lambda^2 - 14\lambda + 6 = 0$
(d) $-\lambda^3 + 7\lambda^2 + 16\lambda + 12 = 0$
(e) $-\lambda^3 + 7\lambda^2 - 16\lambda + 12 = 0$

(4)

12. The eigenvalues of the matrix A of the previous problem are

Select the correct answer.

(a) $-2, -2, 3$
(b) $2, 2, 3$
(c) $1 \pm i, 3$
(d) $-1 \pm i, 3$
(e) $1 \pm \sqrt{3}i, 3$

(5)

13. Let A be the matrix of the previous two problems. The solution of $\mathbf{X}' = A\mathbf{X}$ is

Select the correct answer.

(a) $c_1 \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} e^{3t} + c_2 \begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix} e^{2t} + c_3 \left[\begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix} te^{2t} + \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} e^{2t} \right]$

(b) $c_1 \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} e^{-3t} + c_2 \begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix} e^{-2t} + c_3 \left[\begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix} te^{-2t} + \begin{pmatrix} 0 \\ -1 \\ 0 \end{pmatrix} e^{-2t} \right]$

(c) $c_1 \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} e^{3t} + c_2 \begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix} e^{-2t} + c_3 \left[\begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix} te^{-2t} + \begin{pmatrix} 0 \\ -1 \\ 0 \end{pmatrix} e^{-2t} \right]$

(d) $c_1 \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} e^{-3t} + c_2 \begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix} e^{2t} + c_3 \left[\begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix} te^{2t} + \begin{pmatrix} 0 \\ -1 \\ 0 \end{pmatrix} e^{2t} \right]$

(e) $c_1 \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} e^{3t} + c_2 \begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix} e^{2t} + c_3 \left[\begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix} te^{2t} + \begin{pmatrix} 0 \\ -1 \\ 0 \end{pmatrix} e^{2t} \right]$

ANSWER KEY

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1. a
2. b
3. c
4. d
5. a
6. c
7. c
8. b
9. b
10. a
11. e
12. b
13. e
14. d
15. d
16. a
17. d
18. e
19. c
20. a