

-
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.

- (1) (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) $-\lambda^3 + 7\lambda^2 - 16\lambda + 12 = 0$

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

Select the correct answer.

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

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

Select the correct answer.

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

14. The characteristic equation of $A = \begin{pmatrix} 2 & -2 \\ 2 & 2 \end{pmatrix}$ is

Select the correct answer.

(4)

- (a) $\lambda^2 - 4\lambda = 0$
- (b) $\lambda^2 + 4\lambda = 0$
- (c) $\lambda^2 + 4\lambda - 8 = 0$
- (d) $\lambda^2 - 4\lambda + 8 = 0$
- (e) $\lambda^2 - 4\lambda - 8 = 0$

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

Select the correct answer.

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

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

(5)

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

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

(e) none of the above

ANSWER KEY

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