1. $\mathbf{J_4}^T$ = ___________

2. From 1), conclude that $\mathbf{J_4}$ is a(n) ____________________matrix.

3. $\mathbf{J_4}^2$ = ___________

4. From 3), conclude that $\mathbf{J_4}^{-1}$ = ___________

5. $\mathbf{J_4}^T\mathbf{J_4}$ = ___________

6. From 5), conclude that $\mathbf{J_4}$ is a(n) ______________________ matrix.

7. Use the MATLAB command **eig** to obtain the eigenvalues of $\mathbf{J_4}$: they are _________ and _________.

8. $\mathbf{J_4}$ – **eye(4)** =

9. **rref**($\mathbf{J_4}$ – **eye(4)**) =

10. A basis of the null space of $\mathbf{J_4}$ – **eye(4)** is ______________________ .

11. From 10), conclude that the eigenvectors of $\mathbf{J_4}$ – **eye(4)** corresponding to $\lambda = 1$ are ______________ .

12. Denote $\mathbf{J_4}$ in MATLAB by **J** and use the MATLAB command
[V D] = eig(J). Another set of eigenvectors corresponding to $\lambda = 1$ is ___________________ .

13. $\mathbf{J_4}$ + **eye(4)** =

14. **rref**($\mathbf{J_4}$ + **eye(4)**) =

15. A basis of the null space of $\mathbf{J_4}$ + **eye(4)** is ____________________ .

16. From 15), conclude that the eigenvectors corresponding to $\lambda = -1$ are ____________________ .

17. Denote $\mathbf{J_4}$ in MATLAB by **J** and use the MATLAB command
[V D] = eig(J). Another set of eigenvectors corresponding to $\lambda = -1$ is ____________________ .

18. Write a one-line MATLAB program to define, and then display, the 6×6 reversal matrix $\mathbf{J_6}$. The reversal matrix can be denoted by **J** in the program.

19. $\mathbf{J_6}^\mathbf{T}$ = ___________

20. $\mathbf{J_6}$ is a(n) ______________________ matrix.

21. $\mathbf{J_6}^\mathbf{2}$ = ___________

22. $\mathbf{J_6}^\mathbf{-1}$ = ___________

23. $\mathbf{J_6}^\mathbf{T}\mathbf{J_6}$ = ___________

24. $\mathbf{J_6}$ is a(n) ______________________ matrix.

25. The eigenvalues of $\mathbf{J_6}$ are ___________ and ___________.

26. $\mathbf{J_6}$ – **eye(6)** =

27. **rref**($\mathbf{J_6}$ – **eye(6)**) =

28. A basis of the null space of $\mathbf{J_6}$ – **eye(6)** is ______________________ .

29. From 28), conclude that the eigenvectors of $\mathbf{J_6}$ – **eye(6)** corresponding to $\lambda = 1$ are _______________________ .

30. Denote $\mathbf{J_6}$ in MATLAB by **J** and use the MATLAB command
[V D] = eig(J). Another set of eigenvectors corresponding to $\lambda = 1$ is _______________________ .

31. $\mathbf{J_6}$ + **eye(6)** =

32. **rref** ($\mathbf{J_6}$ + **eye(6)**) =

33. A basis of the null space of $\mathbf{J_6}$ + **eye(6)** is _____________________ .

34. The eigenvectors of $\mathbf{J_6}$ + **eye(6)** corresponding to $\lambda = -1$ are ____________________ .

35. Denote $\mathbf{J_6}$ in MATLAB by **J** and use the MATLAB command

[V D] = eig(J). Another set of eigenvectors corresponding to $\lambda = -1$ is ______________________ .

36. Repeat Exercises 18 – 35 for the 8×8 reversal matrix $\mathbf{J_8}$.

37. Use the results of Exercises 7, 25, and 36 to form a conjecture about the eigenvalues of an $n \times n$ reversal matrix $\mathbf{J_n}$ for even numbers n (n = 2k where k is a positive integer).

38. Use the results of Exercises 12, 17, 29, 34, and 36 to form a conjecture about the eigenvectors of an $n \times n$ reversal matrix $\mathbf{J_n}$ for even numbers n.

39. Use the experience gained from Exercises 1 to 38 to form a conjecture about the eigenvalues and eigenvectors of an $n \times n$ reversal matrix $\mathbf{J_n}$ for odd numbers n of the form n = 2k + 1.