## MAS 2103 Matrix Theory Definitions

Throughout we let $A = (a_{ij})$ denote an $n \times m$ matrix, and $B = (b_{ij})$ denote a $r \times k$ matrix. We let $\mathbb{F}$ denote a field and $V$ and $W$ are $\mathbb{F}$-vector spaces. Let $T : V \to W$ be a linear transformation.

1. A system of linear equations is **consistent** if

2. A system of linear equations is **inconsistent** if

3. A system of linear equations is said to be **homogeneous** if

4. The **order** of a matrix is

5. The set of all $n \times m$ matrices is denoted by

6. The matrix is a **square** matrix if

7. The $n \times n$ **identity** matrix is defined as $I_n = (m_{ij})$ where

8. The matrix $A$ is said to be in **row echelon form** if

9. The matrix $A$ is said to be in **reduced echelon form** if

10. The **transpose** of the matrix $A$ is the matrix

11. The *trace* of the matrix $A$ is

12. The matrix $A$ is said to be **symmetric** if

13. The matrix $A$ is said to be **skew-symmetric** if

14. The matrix $A$ is said to be **orthogonal** if

15. The matrix $A$ is said to be **diagonal** if

16. The matrix $A$ is said to be **upper triangular** if

17. The matrix $A$ is said to be **lower triangular** if

18. The matrix $A$ is said to be **triangular** if

19. The matrix $A$ is said to have a **LU-factorization** if

20. The matrix $A$ is said to be **invertible** if

21. The **inverse** of the (square) matrix $A$ is

22. The matrices $A$ and $B$ are said to be **similar** if

23. The matrices $A$ and $B$ are said to be **row equivalent** if

24. The matrix $A$ is said to be **diagonalizable** if

25. The **determinant** of the (square) matrix $A$ is defined as the quantity

26. A (square) matrix $A$ is said to be **idempotent** if

27. A **group** is a

28. A **field** is a

29. A **scalar** is

30. An **$\mathbb{F}$-vector space** is a

31. A **subspace** of $V$ is

32. Let $S \subseteq V$ be a set of vectors. The **span** of $S$ (i.e. the subspace generated by $S$) is

33. A set of vectors, say $S$, is said to be **linearly dependent** if

34. A set of vectors, say $S$, is said to be **linearly independent** if

35. A set of vectors, say $S$, is said to be a **basis** if

36. The **dimension** of a subspace of $V$ is

37. The **row space** of a matrix is

38. The **column space** of a matrix is

39. The **nul space** of a matrix is

40. The **rank** of the matrix $A$ is denoted by $\text{rank}(A)$ and is

41. The **nullity** of a matrix $A$ is denoted by $\text{nullity}(A)$ and is

42. The notation $f : C \to D$ is read as

43. In the notation $f : C \to D$ the letter $f$ is called the

44. In the notation $f : C \to D$ the set $C$ is called the

45. In the notation $f : C \to D$ the set $D$ is called the

46. A function $T : V \to W$ is called a **linear transformation** if

47. A function $T : V \to W$ is called a **linear isomorphism** if

48. Let $T : V \to W$ be a linear transformation and $v \in V$. The **image** of $v$ is

49. The **range** of $T$ is

50. Let $T : V \to W$ be a linear transformation and $w \in W$. The **preimage** of $w$ is

51. The kernel of the linear transformation $T : V \to W$ is

52. The function $f : C \to D$ is said to be **one-to-one** (aka *injective*) if

53. The function $f : C \to D$ is said to be **onto** (aka **surjective** if

54. The function $f : C \to D$ is called a **bijection** if

55. The function $f : C \to D$ is called a **permutation** if

56. The **(standard) matrix representation** of the linear transformation $T : \mathbb{R}^n \to \mathbb{R}^m$ is

57. An **eigenvalue** for he matrix $A$ is

58. An **eigenvector** for the matrix $A$ is

59. The **characteristic polynomial** of the matrix $A$ is

60. The **eigenspace** of $A$ corresponding to the eigenvalue $\lambda$ is denoted by $E_\lambda$ and is