Vocabulary

Word	Meaning
Consistent	If it has at least one solution.
Row equivalent	If a sequence of row operations transforms one matrix into the other.
Unique solution	If and only if there are no free variables
Homogeneous	Linear systems of the form $A\mathbf{x} = \mathbf{0}$
Inhomogeneous	Linear systems of the form $A\mathbf{x} = \mathbf{b}$ where $\mathbf{b} \neq \mathbf{0}$
Trivial solution	The solution is the zero vector
Linearly independent	If no vector can be made from other vectors
Row operations	Addition, Interchange, Scaling
Pivot position	A leading 1 in the RREF of A
Pivot column	Is a column of A that contains a pivot position
Domain	$T : \mathbb{R}^n \to \mathbb{R}^m$; $\mathbb{R}^n$ is the domain of T
Codomain	$T : \mathbb{R}^n \to \mathbb{R}^m$; $\mathbb{R}^m$ is the codomain of T
Image	The vector $T(\vec{x})$ is the image of $\vec{x}$ under T
Range	The set of all possible images $T(\vec{x})$ or simply the **span of A**
Standard vectors	The column of the identity matrix (think $\begin{bmatrix} 1 \\ 0 \end{bmatrix}$ and $\begin{bmatrix} 0 \\ 1 \end{bmatrix}$)
Onto	All the elements in the codomain are mapped to. (A spans the entire codomain), Every **row** is pivotal
One-To-One	Each mapping is unique (2 vectors can **NOT** map to the same vector), Every **column** is pivotal
Transpose	The matrix whose columns are the rows of A
Invertible	$A \in \mathbb{R}^{n\times n}$ is invertible if there is a $C \in \mathbb{R}^{n\times n}$ such that: $AC = CA = I_n$
Elementary Matrix	Differs from I_n by one row operation.
Singular	A matrix that is not invertible (A^{-1} DNE)

Word	Meaning
Subset	A subset of $\mathbb{R}^n$ any collection of vectors that are in $\mathbb{R}^n$
Subspace	If $H \in \mathbb{R}^n$, for $c \in \mathbb{R}$ and $\vec{u}, \vec{v} \in H$, $c\vec{u} \in H$ and $\vec{u} + \vec{v} \in H$ must be true if H is a subspace.
Column Space	This is a subspace spanned by the column of A.
Null Space	This is a subspace spanned by all $\vec{x}$ such that $A\vec{x} = \vec{0}$.
Basis	This is a set of linearly independent vectors in H that spans H assuming H is a subspace.
Coordinate Vector	These are the vectors that are used to describe the coordinate systems.
Coordinates	These are the weights of the coordinate vector used to describe the point.
Dimension	This is the number of vectors in a basis of H.
Cardinality	Same thing as Dimension
Rank	$\text{Rank}(A) = \dim(\text{Col}(A)) = \text{no of pivot columns}$
Determinant	It is the scaling factor that tells us how a transformation will change the area or volume of a region.
Probability Vector	A vector with non-negative elements that sum to 1
Stochastic Matrix	Square matrix, P, whose columns are probability vectors.
Markov Chain	The sequence: $x\vec{_{k+1}} = P\vec{x_k}$ $(0 \leq k)$
Steady-State Vector	Is the a probability vector such that $P\vec{q} = \vec{q}$
Regular Stochastic Matrix	If there is some k such that P^k only contains positive entries.
Trace	The sum of the elements of the main diagonal.
Characteristic Polynomial	$\det(A - \lambda I)$
Characteristic Equation	$\det(A - \lambda I) = 0$
Multiplicity	The number of times that its associated factor appears in the polynomial.
Algebraic Multiplicity	Multiplicity of the characteristic polynomial.

Word	Meaning
Geometric Multiplicities	Dimensions of $\mathrm{Null}(A - \lambda I)$
Similar Matrices	A and B are similar if there is a P such that $A = PBP^{-1}$.
Diagonal Matrices	If the only non-zero elements, if any, are on the main diagonal.
Diagonalizable	If A is similar to diagonal matrix D ($A = PDP^{-1}$)
Unit Vector	When the length of a vector is 1
Orthogonal	If $\vec{u} \cdot \vec{v} = 0$, then $\vec{u}, \vec{v}$ are Orthogonal
Row space	the space spanned by the rows of matrix A
Orthogonal Sets	If for set $\{\vec{u}_1, \ldots, \vec{v}_n\}$ for $j \neq k$, $\vec{u}_j \perp \vec{u}_k$.
Orthonormal Columns	An $m \times n, m \geq n$ matrix has orthonormal columns $\iff U^T U = I_n$
Symmetric	A matrix is symmetric when $A = A^T$
Spectrum	The set of eigenvalues of a matrix
positive definite	If $Q > 0$ for all $\vec{x} \neq 0$
negative definite	If $Q < 0$ for all $\vec{x} \neq 0$
positive semidefinite	If $Q \geq 0$ for all $\vec{x}$
negative semidefinite	If $Q \leq 0$ for all $\vec{x}$
Indefinite	If Q takes on positive and negative values for $\vec{x} \neq 0$