"Math for ML and DS" Specialization

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1 Linear Algebra for Machine Learning and Data Science

1.1 System of linear equations:

- Systems of equations: **Non-singular** (complete), **Singular** (Redundant, Contradictory).
- **Determinant** of a matrix is the signed **factor by which areas are scaled by this matrix**.
  For A = $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ determinant is $\det(A) = ad - cb$.
  For **non-singular** system determinant has **non-zero** value.
  Determinant of an **inverse matrix** is an **inverse of determinant** for original matrix: $det(A^{-1}) = \frac{1}{det(A)}$.

1.2 Solving system of linear equations:

- **Rank** of a matrix tells how much information matrix has. For example, a matrix with 3 rows max rank is 3, since 3 eq and 3 pieces of information, but if one of eq is just a combination of 2 others then rank will be 2.
  Rank of a matrix can be calculated via **row echelon form**:
  - Zero rows at the bottom.
  - Each row has pivot (leftmost non-zero entry).
  - Every pivot is to the right of the pivots on the rows above.
  - Rank of the matrix is the number of pivots

  Difference of Reduced REF from REF is that any number above a pivot is **0** in RREF.

1.3 Vectors and Linear Transformations:

- **Norm** is a function from vector space to the non-nega tive real numbers that behaves **like the distance** from the origin.