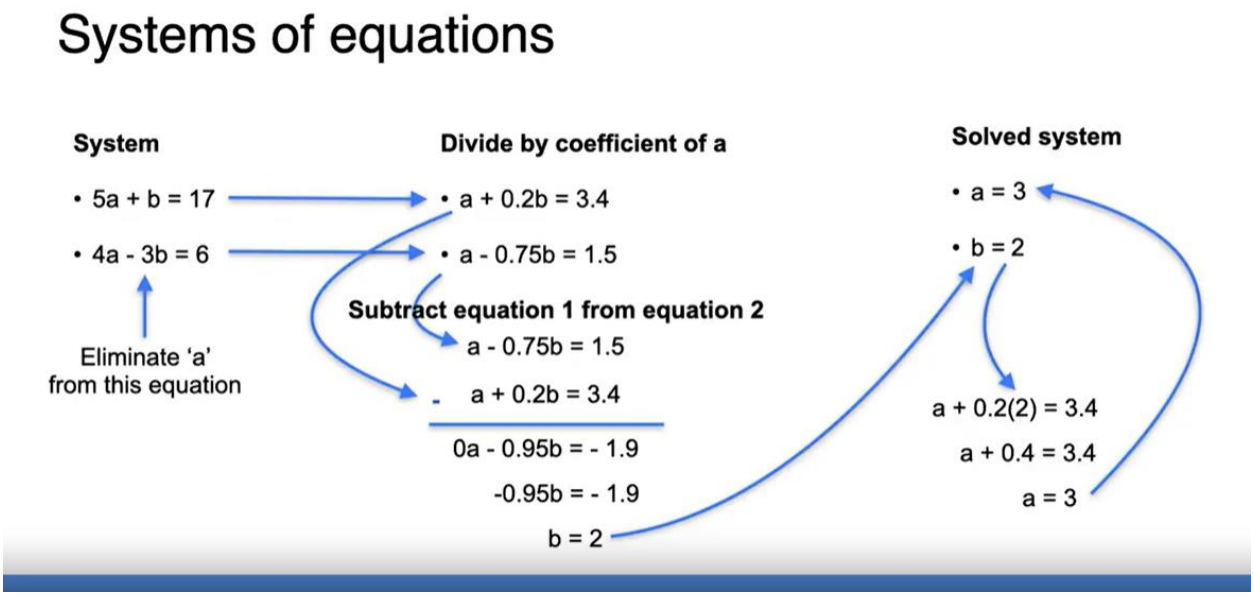
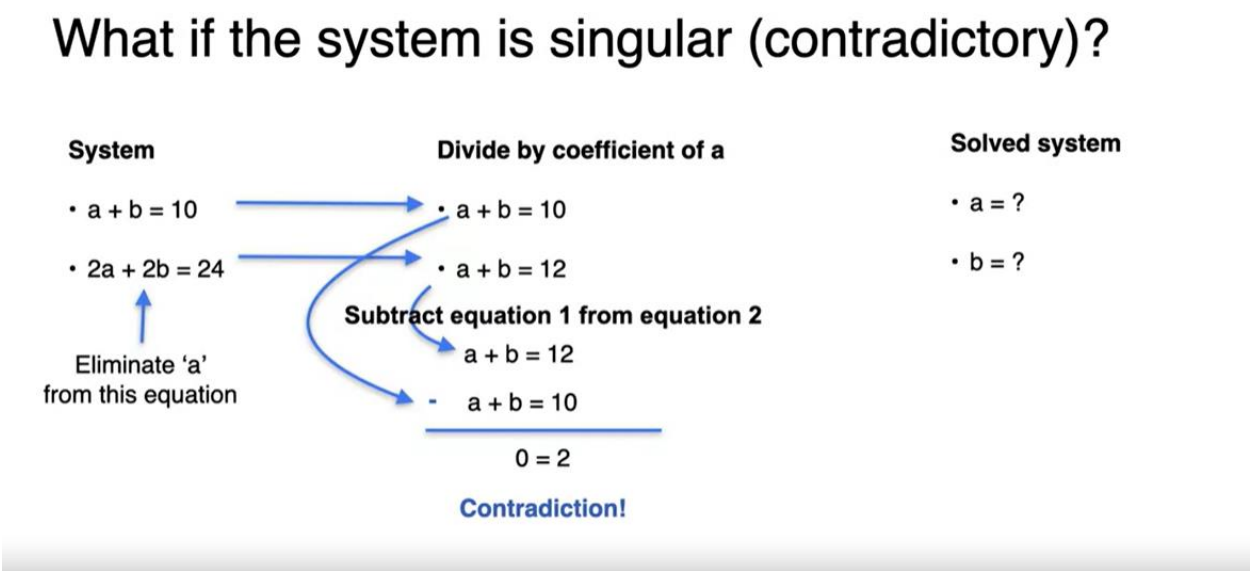
Solving System of linear equations: Elimination

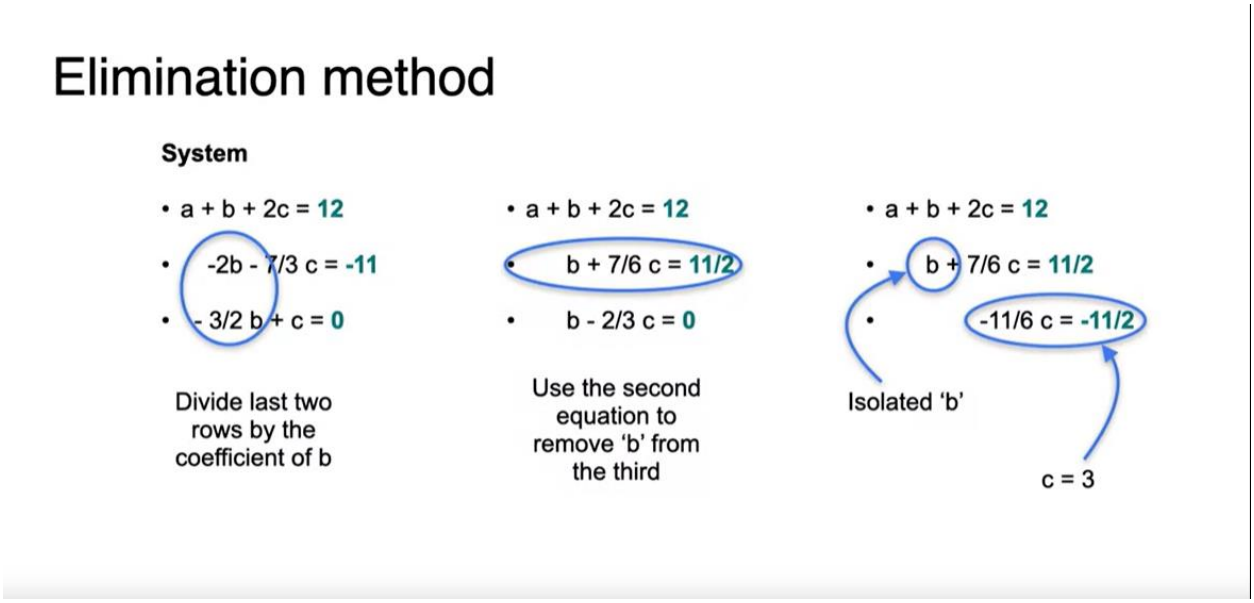
1. Solving non-singular systems of linear equations. (Non-singular system has the unique solution)

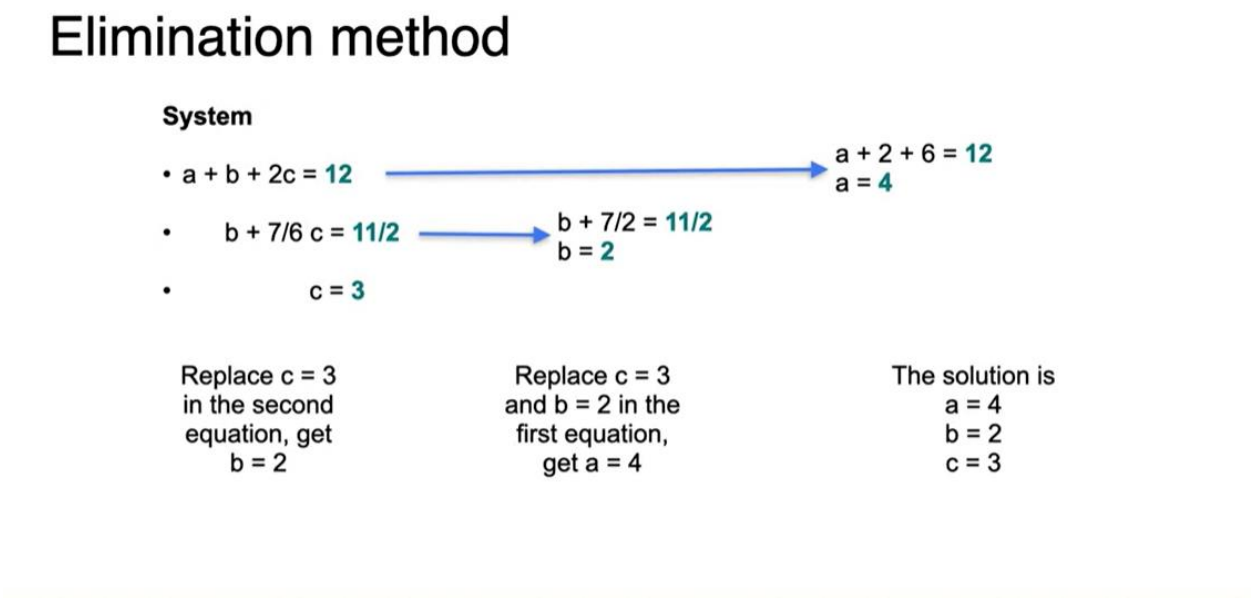


2. Solving singular system of linear equations

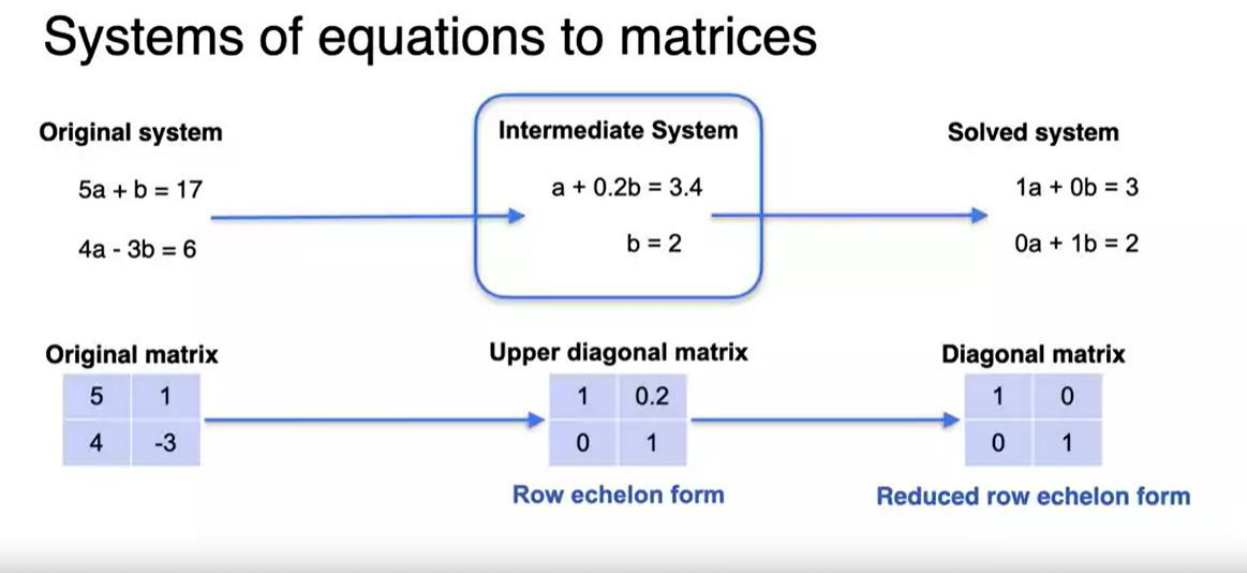


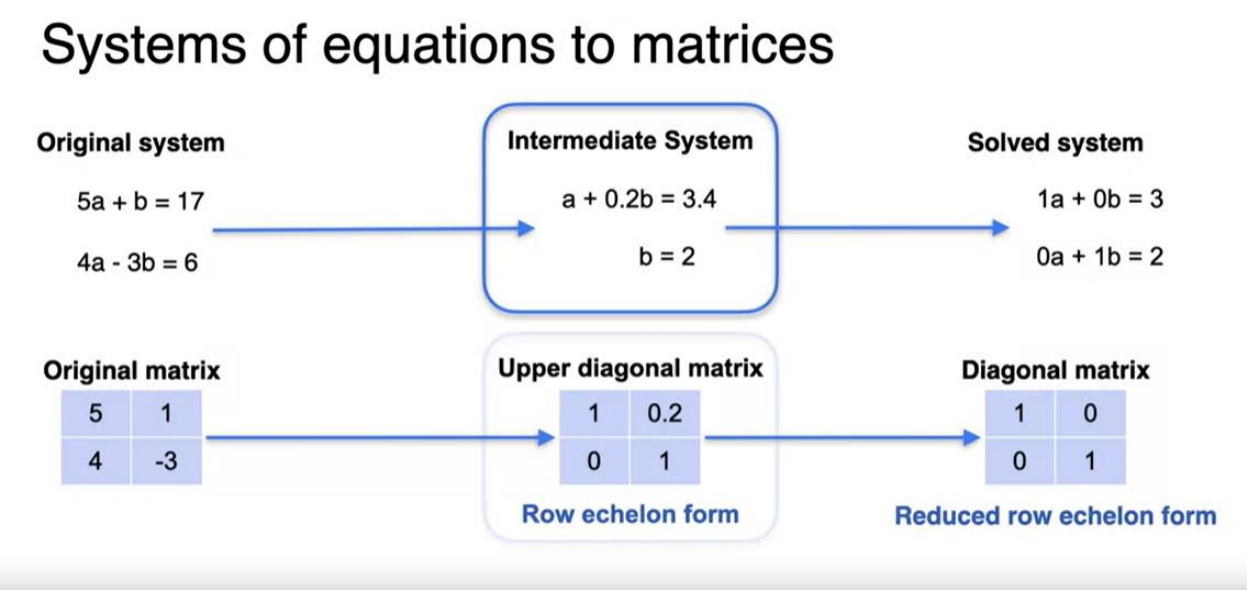
3. Solving Systems of equations with more variable





4. Matrix row-reduction



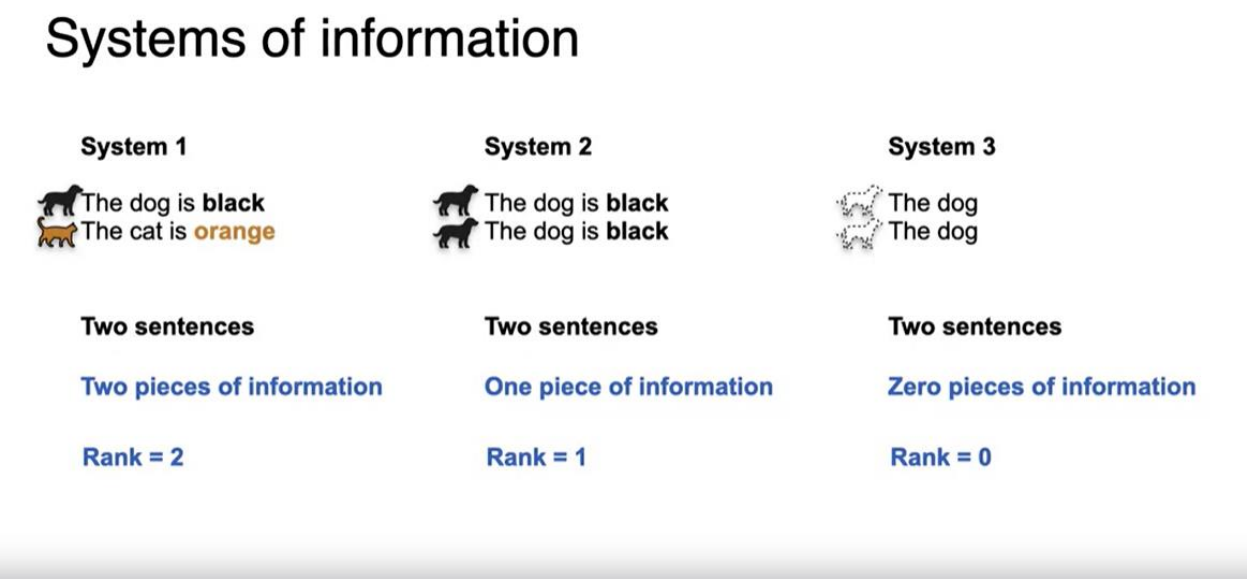


For echelon matrix, On the main diagonal, we can have a bunch of ones followed by perhaps a bunch of zeros. You could potentially have all ones, but you could also have all zeros. Below the diagonal, everything is a zero, to the right of the ones any number is allowed and finally to the right of the zeros, everything must be zero.

5. Row operations that preserve singularity of matrix.
    a. Switching rows
    b. Multiplying a row by a (non-zero) scalar
    c. Adding a row to another row

Solving System of linear equations: Row echelon form and rank

1. The rank of a matrix

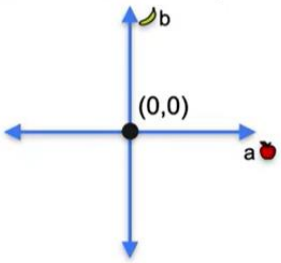


Rank and solutions to the system

1	1
1	2

Rank = 2

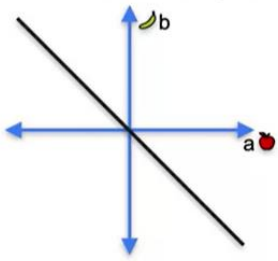
Dimension of solution space = 0



1	1
2	2

Rank = 1

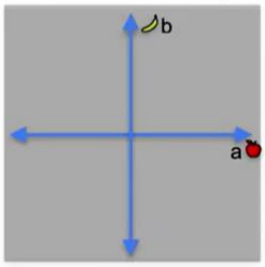
Dimension of solution space = 1



0	0
0	0

Rank = 0

Dimension of solution space = 2



Rank of a matrix

1	1
1	2

Rank = 2

Dimension of solution space = 0

1	1
2	2

Rank = 1

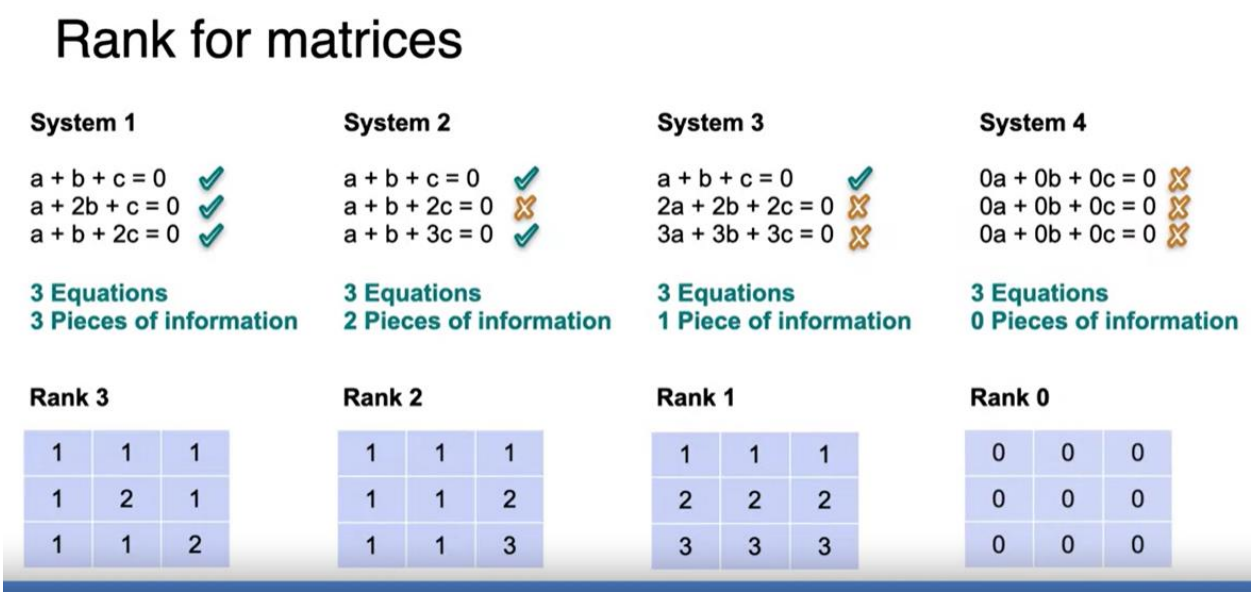
Dimension of solution space = 1

0	0
0	0

Rank = 0

Dimension of solution space = 2

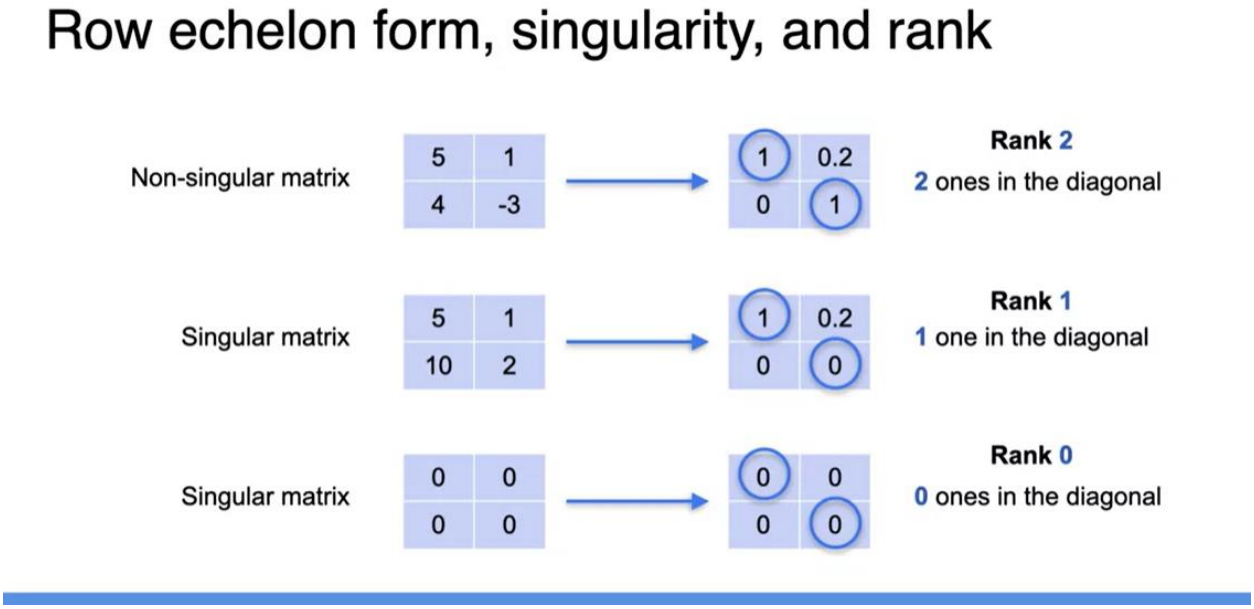
Rank = 2 - (Dimension of solution space)



Is there an easier way to calculate the rank?

>> Yes! It has to do with the row echelon form of the matrix

2. Row echelon form



Rank for matrices

Matrix 1

1	1	1
1	2	1
1	1	2

Rank = 3

Matrix 2

1	1	1
1	1	2
1	1	3

Rank = 2

Matrix 3

1	1	1
2	2	2
3	3	3

Rank = 1

Matrix 4

0	0	0
0	0	0
0	0	0

Rank = 0

Row echelon forms

1	1	1
0	1	0
0	0	1

Number of pivots = 3

1	1	1
0	0	1
0	0	0

Number of pivots = 2

1	1	1
0	0	0
0	0	0

Number of pivots = 1

0	0	0
0	0	0
0	0	0

Number of pivots = 0