Block Multiplication

When multiplying A and B, can break them up into blocks

$$A = \begin{pmatrix} A_{1,1} & \dots & A_{1,n} \\ \vdots & & \\ A_{m,1} & \dots & A_{m,n} \end{pmatrix}, B = \begin{pmatrix} B_{1,1} & \dots & B_{1,p} \\ \vdots & & \\ B_{n,1} & \dots & B_{n,p} \end{pmatrix}$$

Blocks don't have to be the same sizes, but they do have to be able to multiply with each other properly

$$AB = C = \begin{pmatrix} C_{1,1} & \dots & C_{1,p} \\ \vdots & & \\ C_{m,1} & \dots & C_{m,p} \end{pmatrix}$$
$$C_{ik} = \sum_{j=1}^{n} A_{ij} B_{jk}$$

Column Oriented Multiplication

In $AB = C$, each of the columns of C are a linear combination of the columns of A

- Each column in B tells you the coefficients in that linear combination
- Number of columns of A = number of rows of B

Row Oriented Multiplication

In $AB = C$, each of the columns of C are a linear combination of the rows of B

- Each row in A tells you the coefficients in that linear combination
- Number of columns of A = number of rows of B

Multiplying Diagonal Matrices

For a diagonal matrix D and matrix A:

- DA multiplies the i th row in A by the i th element of D
- AD multiplies the i th column in A by the i th element of D