Matricies Cheat sheet

Matricies that will be used

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \; B = \begin{bmatrix} e & f \\ g & h \end{bmatrix}$$

Basics

Naming: Matrix is row by column

Indexing: $C = \begin{bmatrix} c_{1,1} & c_{1,2} \\ c_{2,1} & c_{2,2} \end{bmatrix}$

Multiplication (only possible if A column count = B row count): $AB = \begin{bmatrix} ae+bg & af+bh \\ ce+dg & cf+dh \end{bmatrix}$

Determinant of 2x2: $\det(A) = ad - bc$

Inverse of 2x2: $A^{-1} = \frac{1}{\det(A)} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

Solving Equations

A = coefficient matrix
B = constant matrix

Inverse Matrix

$A^{-1}B = \begin{bmatrix} x \\ y \end{bmatrix}$

Gaussian Elimination

Augment A and B, then manipulate so A looks like identity matrix

- 0 0 ... 0 : 0 = infinity
- 0 0 ... 0 : n = no solution

Example for infinity solution: $\begin{bmatrix} 1 & 0 & 2 & 7 \\ 0 & 1 & -3 & 4 \end{bmatrix}$

- $x + 2z = 7; x = 7 - 2z$
- $y - 3z = 4; y = 4 + 3z$
- For some reason(?) $z = a$
- So solution, $(7 - 2a, 4 + 3a, a)$

Cramers Rule

$X = \frac{1}{\det(A)}$ [Coeff matrix w/ X column swapped for constant]
Same for all other variables
Special Cases:

- $\frac{0}{0}$ = infinity solutions
- $\frac{n}{0}$ = no solutions