

Determinant

$|A| \rightarrow$ determinant of A

\rightarrow single number

\rightarrow if 0, matrix is singular, A^{-1} doesn't exist

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \quad |A| = a \cdot d - b \cdot c$$

$$A = \begin{bmatrix} 2 & 4 \\ 3 & 6 \end{bmatrix} \quad |A| = 2 \cdot 6 - 4 \cdot 3 = 0$$

$$B = \begin{bmatrix} 1 & -3 \\ 2 & -7 \end{bmatrix} \quad |B| = 1(-7) - (-3)(2) = -7 + 6 = -1$$

$\det(A) \quad \det(B)$

$$A = \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix} \quad |A| = aei + bfg + cdh - ceg - bdi - afh$$

$$\begin{array}{ccccc} a & b & c & a & b \\ d & e & f & d & e \\ g & h & i & g & h \end{array} \quad aei + bfg + cdh - ceg - afh - bdi$$

$$A = \begin{bmatrix} 2 & 4 & 1 \\ 3 & 6 & -3 \\ 5 & 10 & -2 \end{bmatrix} \quad |A| = 2 \cdot 6 \cdot (-2) + 4 \cdot (-3) \cdot 5 + 1 \cdot 3 \cdot 10 - 1 \cdot 6 \cdot 5 - 2 \cdot (-3) \cdot 10 - 4 \cdot 3 \cdot (-2)$$

$$= -24 - 60 + 30 - 30 + 60 + 24$$

$$= \underline{\underline{0}}$$

$$A = \begin{bmatrix} a & b & c & d \\ e & f & g & h \\ i & j & k & l \\ m & n & o & p \end{bmatrix} \quad + b h i o \quad \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

$$\begin{array}{ll} (1) & 2x + 3y = 4 \\ (2) & 5x + 2y = 1 \\ (3) & 7x + 5y = 5 \end{array} \quad (1) + (2) = (3)$$

$$(1) \quad 2x + 3y = 4$$

vars $>$ # eqs $\Rightarrow \infty$ solutions

vars = # eqs $\Rightarrow \det(A) \neq 0$ 1 solution
 $\det(A) = 0$ ∞ solutions

vars $<$ # eqs \Rightarrow

- 1 solution
- no solution
- ∞ solutions

$$\left. \begin{array}{l} (1) \quad 2x + 3y = 5 \\ (2) \quad 4x + 6y = 10 \\ (3) \quad 6x + 9y = 15 \end{array} \right\} \infty$$