

Solve for \vec{x} $A\vec{x} = \vec{b}$	$\vec{b} = \vec{0}$	$\vec{b} \neq \vec{0} \quad (\Rightarrow \vec{x} \neq \vec{0})$	A is $m \times n$
<p>Unique solution</p> <p>Columns of A are lin. indep.</p>	<p>$\vec{x} = \vec{0}$ only solution</p>	<p>$\det A \neq 0$ $\Leftrightarrow \vec{x} = A^{-1}\vec{b}$ only solution</p>	<p>Rows of A are lin. indep. (and $m=n$)</p>
		<p>1 solution OR No solution (DNE)</p>	<p>Rows of A are lin. dep. (and $m > n$)</p>
<p>∞ solutions</p>		<p>∞ solutions $\vec{x} \in \text{Span} + \vec{x}_p$</p>	<p>Rows of A are lin. indep. (and $m < n$)</p>
<p>∞ solutions including $\vec{x} = \vec{0}$ $\vec{x} \in \text{Span}$</p>		<p>∞ solutions OR No solution (DNE)</p>	<p>Rows of A are lin. dep.</p>

Solve $A\vec{x} = \vec{b}$	$\vec{b} = \vec{0}$	$\vec{b} \neq \vec{0}$	A is $m \times n$
Columns lin. indep.	$\left[\begin{array}{ccc c} 1 & 1 & 0 & 0 \\ 2 & 0 & 0 & 0 \end{array} \right]$	$\left[\begin{array}{cc c} 1 & 2 & 3 \\ 0 & 1 & 4 \end{array} \right]$	Rows lin. indep. ($m=n$)
	\Leftrightarrow	\Leftrightarrow	
Columns lin. dep.	$\left[\begin{array}{ccc c} 1 & 0 & 0 & 0 \\ 2 & 1 & 0 & 0 \\ 3 & 0 & 0 & 0 \\ 4 & 1 & 0 & 0 \end{array} \right]$	$\left[\begin{array}{ccc c} 1 & 2 & 3 & 4 \\ 0 & 1 & 0 & 1 \end{array} \right]$	Rows lin. dep. ($m > n$)
	\Leftrightarrow	\Leftrightarrow	
	$\left[\begin{array}{ccc c} 1 & 2 & 3 & 4 \\ 0 & 1 & 0 & 0 \end{array} \right]$	$\left[\begin{array}{ccc c} 1 & 2 & 3 & 4 \\ 0 & 1 & 0 & -1 \end{array} \right]$	Rows lin. indep. ($m < n$)
	\Leftrightarrow	\Leftrightarrow	
	$\left[\begin{array}{ccc c} 1 & 2 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{array} \right]$ $\det = 0$	$\left[\begin{array}{cc c} 1 & 2 & 3 \\ 0 & 0 & 4 \end{array} \right]$ $\det = 0$	Rows lin. dep.
	\Leftrightarrow	\Leftrightarrow	
	$\left[\begin{array}{ccc c} 1 & 0 & 3 & 0 \\ 0 & 0 & 0 & 0 \end{array} \right]$	$\left[\begin{array}{cc c} 1 & 2 & 3 \\ 0 & 0 & 0 \end{array} \right]$ $\det = 0$	
		$\left[\begin{array}{ccc c} 1 & 2 & 7 & 0 \\ 0 & 0 & 0 & 0 \end{array} \right]$	