

$|A| \neq 0 \iff$ columns of A are linearly independent

• $\vec{a}_1, \vec{a}_2, \vec{a}_3$ are linearly independent \iff $\vec{b}_1, \vec{b}_2, \vec{b}_3$ are linearly independent \iff $\vec{c}_1, \vec{c}_2, \vec{c}_3$ are linearly independent \iff $\vec{d}_1, \vec{d}_2, \vec{d}_3$ are linearly independent \iff $\vec{e}_1, \vec{e}_2, \vec{e}_3$ are linearly independent \iff $\vec{f}_1, \vec{f}_2, \vec{f}_3$ are linearly independent \iff $\vec{g}_1, \vec{g}_2, \vec{g}_3$ are linearly independent \iff $\vec{h}_1, \vec{h}_2, \vec{h}_3$ are linearly independent \iff $\vec{i}_1, \vec{i}_2, \vec{i}_3$ are linearly independent \iff $\vec{j}_1, \vec{j}_2, \vec{j}_3$ are linearly independent \iff $\vec{k}_1, \vec{k}_2, \vec{k}_3$ are linearly independent \iff $\vec{l}_1, \vec{l}_2, \vec{l}_3$ are linearly independent \iff $\vec{m}_1, \vec{m}_2, \vec{m}_3$ are linearly independent \iff $\vec{n}_1, \vec{n}_2, \vec{n}_3$ are linearly independent \iff $\vec{o}_1, \vec{o}_2, \vec{o}_3$ are linearly independent \iff $\vec{p}_1, \vec{p}_2, \vec{p}_3$ are linearly independent \iff $\vec{q}_1, \vec{q}_2, \vec{q}_3$ are linearly independent \iff $\vec{r}_1, \vec{r}_2, \vec{r}_3$ are linearly independent \iff $\vec{s}_1, \vec{s}_2, \vec{s}_3$ are linearly independent \iff $\vec{t}_1, \vec{t}_2, \vec{t}_3$ are linearly independent \iff $\vec{u}_1, \vec{u}_2, \vec{u}_3$ are linearly independent \iff $\vec{v}_1, \vec{v}_2, \vec{v}_3$ are linearly independent \iff $\vec{w}_1, \vec{w}_2, \vec{w}_3$ are linearly independent \iff $\vec{x}_1, \vec{x}_2, \vec{x}_3$ are linearly independent \iff $\vec{y}_1, \vec{y}_2, \vec{y}_3$ are linearly independent \iff $\vec{z}_1, \vec{z}_2, \vec{z}_3$ are linearly independent \iff $\vec{a}_1, \vec{a}_2, \vec{a}_3$ are linearly independent

$$\begin{bmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{bmatrix} \begin{matrix} \text{are linearly independent} \\ \text{iff} \\ \text{the columns of } A \text{ are linearly independent} \end{matrix}$$

• $\vec{a}_1, \vec{a}_2, \vec{a}_3$ are linearly independent \iff $\vec{b}_1, \vec{b}_2, \vec{b}_3$ are linearly independent \iff $\vec{c}_1, \vec{c}_2, \vec{c}_3$ are linearly independent \iff $\vec{d}_1, \vec{d}_2, \vec{d}_3$ are linearly independent \iff $\vec{e}_1, \vec{e}_2, \vec{e}_3$ are linearly independent \iff $\vec{f}_1, \vec{f}_2, \vec{f}_3$ are linearly independent \iff $\vec{g}_1, \vec{g}_2, \vec{g}_3$ are linearly independent \iff $\vec{h}_1, \vec{h}_2, \vec{h}_3$ are linearly independent \iff $\vec{i}_1, \vec{i}_2, \vec{i}_3$ are linearly independent \iff $\vec{j}_1, \vec{j}_2, \vec{j}_3$ are linearly independent \iff $\vec{k}_1, \vec{k}_2, \vec{k}_3$ are linearly independent \iff $\vec{l}_1, \vec{l}_2, \vec{l}_3$ are linearly independent \iff $\vec{m}_1, \vec{m}_2, \vec{m}_3$ are linearly independent \iff $\vec{n}_1, \vec{n}_2, \vec{n}_3$ are linearly independent \iff $\vec{o}_1, \vec{o}_2, \vec{o}_3$ are linearly independent \iff $\vec{p}_1, \vec{p}_2, \vec{p}_3$ are linearly independent \iff $\vec{q}_1, \vec{q}_2, \vec{q}_3$ are linearly independent \iff $\vec{r}_1, \vec{r}_2, \vec{r}_3$ are linearly independent \iff $\vec{s}_1, \vec{s}_2, \vec{s}_3$ are linearly independent \iff $\vec{t}_1, \vec{t}_2, \vec{t}_3$ are linearly independent \iff $\vec{u}_1, \vec{u}_2, \vec{u}_3$ are linearly independent \iff $\vec{v}_1, \vec{v}_2, \vec{v}_3$ are linearly independent \iff $\vec{w}_1, \vec{w}_2, \vec{w}_3$ are linearly independent \iff $\vec{x}_1, \vec{x}_2, \vec{x}_3$ are linearly independent \iff $\vec{y}_1, \vec{y}_2, \vec{y}_3$ are linearly independent \iff $\vec{z}_1, \vec{z}_2, \vec{z}_3$ are linearly independent \iff $\vec{a}_1, \vec{a}_2, \vec{a}_3$ are linearly independent

$\vec{a}_1, \vec{a}_2, \vec{a}_3$