

### Math 194 Units 1 and 2 Summary

<i>Context</i>	<i>Example</i>	<i>Visualization</i>	<i>Question 1</i>	<i>Question 2</i>	<i>Question 3</i>
Systems of Linear Equations	Solve $2x_1 - 3x_2 = 4$ , $x_1 + 5x_2 = 3$ .	Intersecting lines, planes, and so on	Is the system consistent?	If so, is the solution unique?	Is the system consistent for all possible right hand sides?
Vector Equations	Solve $x_1 \begin{bmatrix} 2 \\ 1 \end{bmatrix} + x_2 \begin{bmatrix} -3 \\ 5 \end{bmatrix} = \begin{bmatrix} 4 \\ 3 \end{bmatrix}$ .	Head-to-tail addition of scaled vectors	Is $\begin{bmatrix} 4 \\ 3 \end{bmatrix}$ a linear combination of $\begin{bmatrix} 2 \\ 1 \end{bmatrix}$ and $\begin{bmatrix} -3 \\ 5 \end{bmatrix}$ ?	Are the vectors $\begin{bmatrix} 2 \\ 1 \end{bmatrix}$ and $\begin{bmatrix} -3 \\ 5 \end{bmatrix}$ linearly independent?	Do the vectors $\begin{bmatrix} 2 \\ 1 \end{bmatrix}$ and $\begin{bmatrix} -3 \\ 5 \end{bmatrix}$ span $\mathbb{R}^2$ ?
Matrix Equations	Solve $A\mathbf{x} = \begin{bmatrix} 4 \\ 3 \end{bmatrix}$ where $A = \begin{bmatrix} 2 & -3 \\ 1 & 5 \end{bmatrix}$ .	None	Is $\begin{bmatrix} 4 \\ 3 \end{bmatrix}$ a linear combination of the columns of $A$ ?	Are the columns of $A$ linearly independent?	Do the columns of $A$ span $\mathbb{R}^2$ ?
<i>To Answer:</i>	Not applicable	Not applicable	Row-reduce the augmented matrix. Look for a row of all zeros except for a nonzero entry in the rightmost column.	Row-reduce the augmented matrix. Check for free variables.	Row-reduce the coefficient matrix. Check for a row of all zeros.