

Unit 1: $A\mathbf{x} = \mathbf{b}$ and the four subspaces

Mathematics is a tool for describing the world around us. Linear equations give some of the simplest descriptions, and systems of linear equations are made by combining several descriptions.

In this unit we write systems of linear equations in the matrix form $A\mathbf{x} = \mathbf{b}$. We explore how the properties of A and $\mathbf{b}$ determine the solutions $\mathbf{x}$ (if any exist) and pay particular attention to the solutions to $A\mathbf{x} = \mathbf{0}$. For a given matrix A we ask which $\mathbf{b}$ can be written in the form $A\mathbf{x}$.