Examples of Vector Spaces

Ex: $V = \mathbb{R}^n =$ the set of column vectors of length n, with addition and multiplication by scalars defined "entry by entry."

Ex: $V = \mathbb{R}^{m\times n} =$ the set of m by n matrices, with addition and multiplication by scalars defined "entry by entry."

Ex: $V = P_n =$ the set of polynomials of degree n or less, with addition and multiplication by scalars defined "coefficient by coefficient."
i.e. if

$$p(t) = t^2 + 2t + 3, q(t) = 3t^2 + 4$$

then

$$\begin{aligned}(4p + 3q)(t) &= 4p(t) + 3q(t) = 4(t^2 + 2t + 3) + 3(3t^2 + 4)\\ &= (4 + 3\times 3)t^2 + (4\times 2 + 0)t + (4\times 3 + 3\times 4)\\ &= 13t^2 + 8t + 24\end{aligned}$$