Lines. Planes. Hyperplanes.

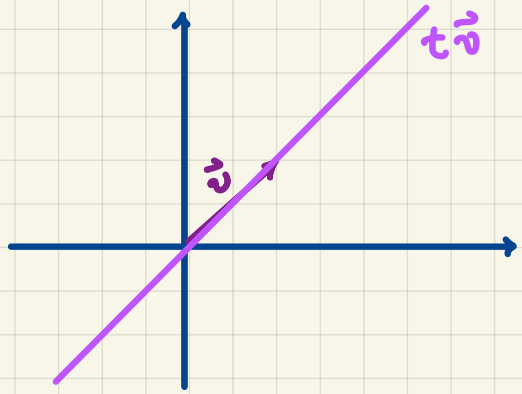
Dan Slaughter.

Lines in $\mathbb{R}^n$.

Start w/ $\vec{v}$, a non-zero vector in $\mathbb{R}^n$, i.e.,

$$\vec{v} = (v_1, v_2, \dots, v_n)$$

For any scalar $t \in \mathbb{R}$, the vector $t\vec{v}$ will have the same
direction as $\vec{v}$ when $t > 0$,
the opposite direction when $t < 0$,
be $\vec{0}$ when $t = 0$.



If we add a vector, say $\vec{p} \neq 0$, then we get a line shifted from the origin

$$\boxed{\{ t \cdot \vec{v} + \vec{p}, \ -\infty < t < \infty \}}$$ is a line in $\mathbb{R}^n$

VECTOR EQUATION

Can be expressed as PARAMETRIC EQUATIONS:

$$\boxed{\begin{aligned} y_1 &= t \cdot v_1 + p_1 \\ y_2 &= t \cdot v_2 + p_2 \\ &\vdots \\ y_n &= t \cdot v_n + p_n \end{aligned}}$$