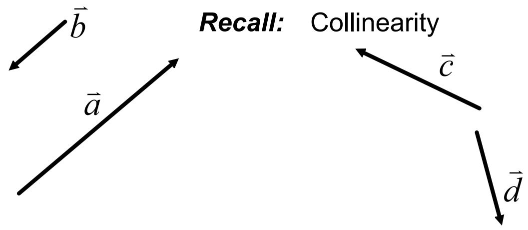
6.8 Linear Combinations and Spanning Sets (Day 1)

Math Learning Target:

"In R^2, I can write any vector as a linear combination of any noncollinear vectors. I can determine if a set of vectors spans R^2. I can apply what I have learned in familiar and unfamiliar settings."

Recall:

"A" if and only if (iff) "B"



Recall: Collinearity

Linear Combination

For ***noncollinear*** vectors $\vec{u}$ and $\vec{v}$, a **linear combination** of these is $a\vec{u} + b\vec{v}$ where a, b are scalars.

The vector $a\vec{u} + b\vec{v}$ is a diagonal of the parallelogram formed by the vectors $a\vec{u}$ and $b\vec{v}$ (if the scalars are nonzero)

Recall: Every vector in R^2 can be written uniquely in terms of the standard unit vectors $\vec{i}$ and $\vec{j}$. This means every vector can be expressed as a linear combination of $\vec{i}$ and $\vec{j}$.

Standard Basis/ Standard Spanning Set (R^2)

The set of vectors $\{\vec{i}, \vec{j}\}$ form the **standard basis/spanning set** for R^2. This means, that every vector in R^2 can be written uniquely as a linear combination of these two vectors.

Is $\{\vec{i}, \vec{j}\}$ the only spanning set of R^2?

EXAMPLE 1 Prove that the vector $(-298, -595)$ can be written as a linear combination of $\vec{u} = (1,4)$ and $\vec{v} = (2,5)$

EXAMPLE 2 Show that the set of vectors $\{(1,4),(2,5)\}$ is a spanning set for R^2.

EXAMPLE 3 Prove the set of vectors $\{(-1,4),(-2,8)\}$ does not span R^2.

Spanning Set (R^2)

Any pair of nonzero, noncollinear vectors will span R2.

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*answer for 15 should be m=2 and n=-3 etc...