Proofs

Proofs should work in a general case, ie instead of a specific vector in a proof it should be an algebraic vector that is specific. Instead of being stuck in a specific dimension, we should expand to multiple dimensions if the proof is tackling that.

If n is an even integer, then n^2 is even

Direct proof

Let n be an even integer. Then n can be written $n = 2k$ for some integer k. Then n^2 = $4k^2 = 2(2k^2)$ which must be even.
#Direct_proof

Proof by contradiction

Let n be an even integer and assume, for the sake of contradiction, that n^2 is odd. Since n is even, n = 2k for some integer k. Then $n^2 = 4k^2 = 2(2k^2)$. However, this requires that
#Proof_by_contradiction

the magnitude of a vector is

$$\sqrt{n_1 + n_2 + \ldots n_n}$$

for any positive set of ns' $\in \mathrm{Re}$. The sum of positive numbers can never be zero. Thus, a b and c must be zero for the magnitude to be zero.

if and only if

requires every statement to have $\Leftrightarrow$.
I.E.

Proof by induction

In a proof by mathematical induction, we prove the statement is true for a base case and then all the cases

suppose u1 u2 ... uk are a set of vectors in Rn that are all orthogonal to $\vec{v} \in R^n$ with k<= n. Then v is orthogonal to any linear combination o

Base case (k-1): any linear combination of one vector can be written $c_1\vec{u_1}$. then $(c_1\vec{v_1}) \cdot$ v - $c_1 \cdot (\vec{u_1} \cdot \vec{v_1})$ = 0 so they are orthogonal.

Inductive hypothesis: Assume the statement is true for k = j, j $\leq n-1$
inductive step($j \to j+1$): suppose that all vectors u_j are orthogonal to $\vec{v}$ consider any linear combination, which we can write.

$$\vec{v} \cdot (c_1\vec{u_1} \ldots c_j\vec{v_j} + c_{j+1}\vec{v_{j+1}})$$

#Proofs

see next: Systems of linear equations
see previous: Vectors