Math 1600A Lecture 2, Section 002

Announcements:

More texts, solutions manuals and packages coming soon.

Read Section 1.2 for next class.

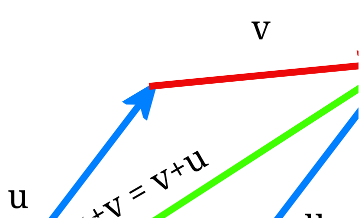
Lecture notes (this page) available from course web page by clicking on our class times.

Office hour: today, 12:30-1:30, MC103B.

Review of last lecture:

A vector can be represented by its list of components, e.g. $[1, 2, -1]$ is a vector in $\mathbb{R}^3$.
We write $\mathbb{R}^n$ for the set of all vectors with n real components, e.g. $[1, 2, 3, 4, 5, 6, 7]$ is in $\mathbb{R}^7$.

Vector addition: $[u_1, \ldots, u_n] + [v_1, \ldots, v_n] := [u_1 + v_1, \ldots, u_n + v_n]$.
E.g. $[3, 2, 1] + [1, 0, -1] = [4, 2, 0]$.



Scalar multiplication: $c[u_1, \ldots, u_n] := [cu_1, \ldots, cu_n]$.
E.g. $2[1, 2, 3, 4, 5] = [2, 4, 6, 8, 10]$.

Zero vector: $\vec{0} := [0, 0, \ldots, 0]$.

New material:

Properties of vector operations:

The picture above shows geometrically that vector addition is *commutative*: $\vec{u} + \vec{v} = \vec{v} + \vec{u}$.

In this true in $\mathbb{R}^n$? Let's check:

$$\begin{aligned} \vec{u} + \vec{v} &= [u_1 + v_1, \ldots, u_n + v_n] \\ &= [v_1 + u_1, \ldots, v_n + u_n] \\ &= \vec{v} + \vec{u}. \end{aligned}$$

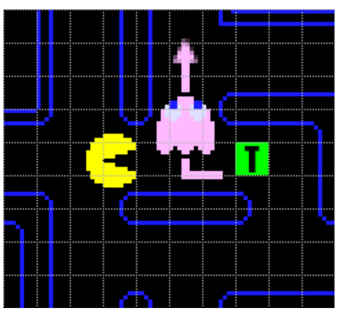
Many other properties that hold for real numbers also hold for vectors: Theorem 1.1. But we'll see differences later.

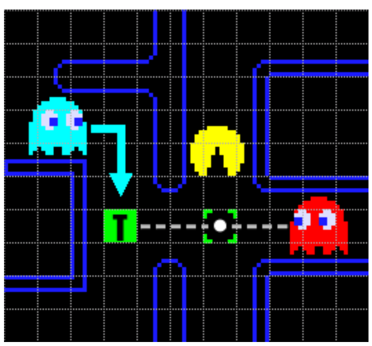
Example: Simplification of an expression:

$$\begin{aligned} & 3\vec{b} + 2(\vec{a} - 4\vec{b}) \\ =\; & 3\vec{b} + 2\vec{a} - 8\vec{b} \\ =\; & 2\vec{a} - 5\vec{b} \end{aligned}$$

An important real-world application:

Pac-Man: Google's version, and How the ghosts move.





Derive an equation for Inky's target on whiteboard.

Continue with Section 1.1 on whiteboard: linear combinations, modular arithmetic.

Next: lecture 3.