In this post, We’ll continue writing R code to accompany linear algebra equations found in Linear Algebra: Step by Step, by Kuldeep Singh. For more information on the origins of these posts, see [the first companion post](https://detroitdatalab.com/2019/05/25/r-companion-to-linear-algebra-step-by-step-part-1/)

Thank to you everyone who hung out throughout the brief hiatus, while life got in the way of linear algebra.

**Section 2.1 – Properties of Vectors**

A brief review of how dot products work, in the form of example 2.1

u <- c(-3,1,7,-5)

v <- c(9,2,-4,1)

u %\*% v

To continue, we’re able to determine the norm (or length) of a vector using a simple chain of square root and sum. Example 2.4 is as follows

u <- c(-7,-2)

v <- c(8,3)

sqrt(sum(u^2))

sqrt(sum(v^2))

Example 2.5 shows more real-world applicability, by showing the distance between two points.

s1 <- c(1,2,3)

s2 <- c(7,4,3)

sqrt(sum((s1-s2)^2))

**Section 2.2 – Further Properties of Vectors**

Let’s simplify the distance function. From here forward, use the following function as distance:

d <- function(u) {sqrt(sum(u^2))}

To show the use of d, here is example 2.6

u <- c(1,5)

v <- c(4,1)

u %\*% v

d(u)\*d(v)

d(u)+d(v)

d(u+v)

For example 2.7, let’s first create an extension of the d function that helps find angles. \*\*Remember\*\* – R trigonometric functions use radians and not degrees!

costheta <- function(vec1,vec2) {vec1%\*%vec2 / (d(vec1)\*d(vec2))}

rad.to.deg <- function(rad) { 180\*rad / pi }

Then we can perform example 2.7 by embedding multiple functions. Feel free to break out as appropriate for your own understanding and simplicity if using elsewhere.

u <- c(-5,-1)

v <- c(4,2)

rad.to.deg(acos(costheta(u,v)))