Homework 1.4.4 Vector Length(norm2)

Compute the lengths of the following vectors:

(a) $\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$

Ans: 0

(b) $\begin{bmatrix} 1/2 \\ 1/2 \\ 1/2 \\ 1/2 \end{bmatrix}$

Ans: 1

(c) $\begin{bmatrix} 1 \\ -2 \\ 2 \end{bmatrix}$

Ans: 3

(d) $\begin{bmatrix} 0 \\ 0 \\ 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}$

Ans: 1

Homework 1.4.4.2

For $x \in \mathbb{R}^n$,

$\| x \|_2 < 0$

NEVER

Homework 1.4.4.3

If x is a unit vector then x is a unit basis vector.

FALSE

Homework 1.4.4.4

If x is a unit basis vector then x is a unit vector.

TRUE

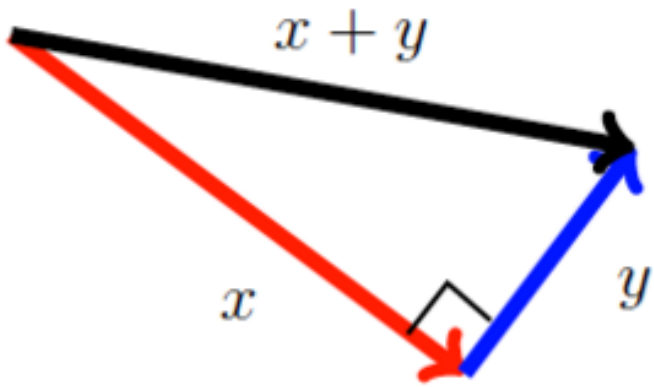

Figure 1: Fig. 1.4.4.5

Homework 1.4.4.5

If x and y are perpendicular (orthogonal) then $x^T\ y = 0$

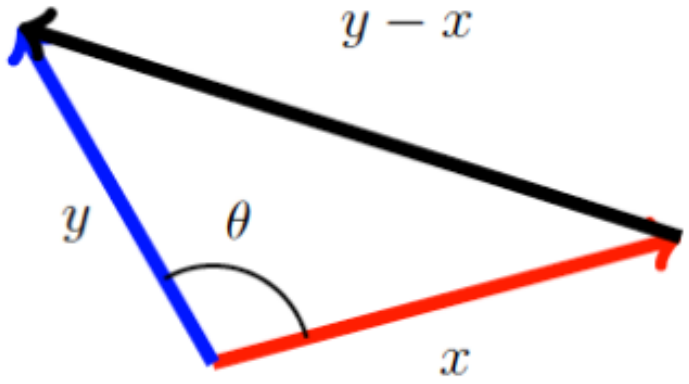

Figure 2: Fig. 1.4.4.6

Homework 1.4.4.6

Let x,$y \in \mathbb{R}^n$ be nonzero vectors and let the angle between them equal θ. Then

$cos\ \theta =$

$$\frac{x^T y}{\|x\|_2 \|y\|_2}$$

TRUE

Hint: Consider the picture and the "Law of Cosines"

Homework 1.4.4.7

Let x,$y \in \mathbb{R}^n$ be nonzero vectors. Then $x^T\ y = 0$ if and only if x and y are orthogonal(perpendicular).

TRUE

Homework 1.4.4.8

What is the approximate cost of computing the length of a vector (if computed by a dot product)?

How many memops?

(a)n

How many flops?

(c)2n