Exercise1-1.R

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###Assignment 1  
  
###Exercise 1  
  
x1 = c(1,4,1,3,2,-6)  
x2 = c(-1,5,2,4,1,-1)  
x3 = c(-1,5,1,0,-1,3)  
  
### a)  
2\*x1-x2+x3

## [1] 2 8 1 2 2 -8

### b)  
### i)  
sum(x1\*x2)

## [1] 41

### ii)  
sum(x2\*x3)

## [1] 24

### iii)  
sum(x1\*x3)

## [1] 0

#x1 und x3 sind orthogonal zu einander"  
  
### c)  
x1%\*%t(x2)

## [,1] [,2] [,3] [,4] [,5] [,6]  
## [1,] -1 5 2 4 1 -1  
## [2,] -4 20 8 16 4 -4  
## [3,] -1 5 2 4 1 -1  
## [4,] -3 15 6 12 3 -3  
## [5,] -2 10 4 8 2 -2  
## [6,] 6 -30 -12 -24 -6 6

### d)  
L1 = norm(as.matrix(x1),type="2")  
L1

## [1] 8.185353

L2 = norm(as.matrix(x2),type="2")  
L2

## [1] 6.928203

L3 = norm(as.matrix(x3),type="2")  
L3

## [1] 6.082763

### d) alternativ  
L1 = sqrt(sum(x1^2))  
L1

## [1] 8.185353

L2 = sqrt(sum(x2^2))  
L2

## [1] 6.928203

L3 = sqrt(sum(x3^2))  
L3

## [1] 6.082763

### e) Calculate the projection of  
### i) x1 on x2  
pro12 = (((t(x2)%\*%x1)/L2)%\*%(1/L2))%\*%x2  
pro12

## [,1] [,2] [,3] [,4] [,5] [,6]  
## [1,] -0.8541667 4.270833 1.708333 3.416667 0.8541667 -0.8541667

### ii) x1 on x3  
pro13 = (((t(x3)%\*%x1)/L3)%\*%(1/L3))%\*%x3  
pro13

## [,1] [,2] [,3] [,4] [,5] [,6]  
## [1,] 0 0 0 0 0 0

#Mit diesem Ergebnis war zu rechnen, da diese beiden Vektoren orthogonal zueinander sind.