

Assignment1

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1. Problem Set 1

Netflix assignemnt.

1. Calculate the dot product $u \cdot v$ where $u = [0.5; 0.5]$ and $v = [3; -4]$

```
u = c(0.5,0.5)
v = c(3,-4)
u%*%v
```

```
##      [,1]
## [1,] -0.5
```

```
#The answer is -0.5
```

2. What are the lengths of u and v .

```
v = c(3,-4)
sqrt(v%*%v)
```

```
##      [,1]
## [1,]    5
```

```
#The answer is 5.0 for the length of v
```

```
u = c(0.5,0.5)
sqrt(u%*%u)
```

```
##      [,1]
## [1,] 0.7071068
```

```
#The answer is 0.707 for the length of u
```

3. What is the linear combination of $3u-2v$?

```
u = c(0.5,0.5)
v = c(3,-4)
3*u - 2*v
```

```
## [1] -4.5  9.5
```

```
#the answer is vector [-4.5 9.5]
```

4. What is the angle between u and v

Equation is $\cos(\theta) = \frac{u \cdot v}{\|u\| \|v\|}$

```
dot = u%%v
magu = sqrt(u%*%u)
magv = sqrt(v%*%v)
costheta = dot / (magu * magv)

acos(costheta)
```

```
##           [,1]
## [1,] 1.712693
```

```
#the angle is 1.713 radians
```

Solving a system of equations using R only not built in functions

```

A = matrix(c(1,2,-1,1,-1,-2,3,5,4), nrow=3, ncol=3)
b = matrix(c(1, 2, 6), nrow = 3)

calc <- function (A,b){
full = cbind(A,b)

i=1
j=1

#part 1
while (i <= nrow(full)-1){
  c = full[i+1,j]/full[j,j]
  full[i+1,] = full[i+1,]-c*full[j,]
  i = 1+i
}

i=2
j=2
#part 2
while (i <= nrow(full)-1){
  c = full[i+1,j]/full[j,j]
  full[i+1,] = full[i+1,]-c*full[j,]
  i = 1+i
}

x3 = full[j+1,j+2]/full[j+1,j+1]
x2 = (full[j,j+2] - full[j,j+1]*x3)/full[j,j]
x1 = (full[j-1,j+2] - full[j-1,j+1]*x3 - full[j-1,j]*x2 )/full[j-1,j-1]

sol = cbind(x1, x2, x3)
return(sol)
}

calc(A,b)

```

```

##           x1           x2           x3
## [1,] -1.545455 -0.3181818 0.9545455

```