DATA 605 - Homework 1

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```
library(ggplot2)
library(psych)
library(dplyr)
library(knitr)
library(tidyr)
```

Problem Set 1

```
u = c(.5,.5)
v = c(3,-4)
dotuv = u[1] * v[1] + u[2] * v [2]
dotuv
```

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

```
dotprod <- function(u,v) {
  if (length(u) != length(v)) {
    result = 'Error: vectors are of different length'
  }
  else {
    sumdotprod = 0
    for(i in c(1:length(u))){
      sumdotprod = sumdotprod + (u[i] * v[i])
    }
    result = sumdotprod
  }
return(result)
  }
```

```
dotprod(u,v)
```

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

The length is the square root of the dot product with itself. We can therefore call the function above with the same argument for both vectors and square root the result:

```
len_u = sqrt(dotprod(u,u))
len_v = sqrt(dotprod(v,v))

len_u
```

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

```
len_v
```

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

The linear combination is:

```
3*u-2*v
```

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

and the angle between the two vectors is (in degrees):

```
acos(dotprod(u,v)/(len_u * len_v))*180/pi
```

```
## [1] 98.1301
```

Problem Set 2

```
GaussJordan <- function(A,b) {

  c12 = A[2,1]/A[1,1]
  A[2,] = A[2,]-A[1,]*c12
  b[2]=b[2]-b[1]*c12

  c13 = A[3,1]/A[1,1]
  A[3,] = A[3,]-A[1,]*c13
  b[3] = b[3]-b[1]*c13

  c23 = A[3,2]/A[2,2]
  A[3,] = A[3,]-A[2,]*c23
  b[3] = b[3]-b[2]*c23

  c3=A[3,3]
  A[3,] = A[3,]/c3
  b[3] = b[3]/c3

  c23 = A[2,3]
  A[2,] = A[2,]-A[3,]*c23
  b[2] = b[2]-b[3]*c23

  c22 = A[2,2]
  A[2,] = A[2,]/c22
  b[2] = b[2]/c22

  c13 = A[1,3]
  A[1,] = A[1,]-A[3,]*c13
  b[1] = b[1]-b[3]*c13
```

```
  c22 = A[2,2]
  A[1,] = A[1,]-A[2,]*c22
  b[1] = b[1]-b[2]*c22

  return(b)

}
```

Testing with the given system:

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

round(GaussJordan(A,b),2)
```

```
## [1] -1.55 -0.32  0.95
```

Github:

https://github.com/chilleundso/Data606/blob/master/FinalProject/Manolis%20Manoli%20Final%20Project.Rmd