

# 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 (both PDF and RMarkdown):

[https://github.com/chilleundso/Data605\\_CompMath/tree/master/Homework1](https://github.com/chilleundso/Data605_CompMath/tree/master/Homework1)