uProject

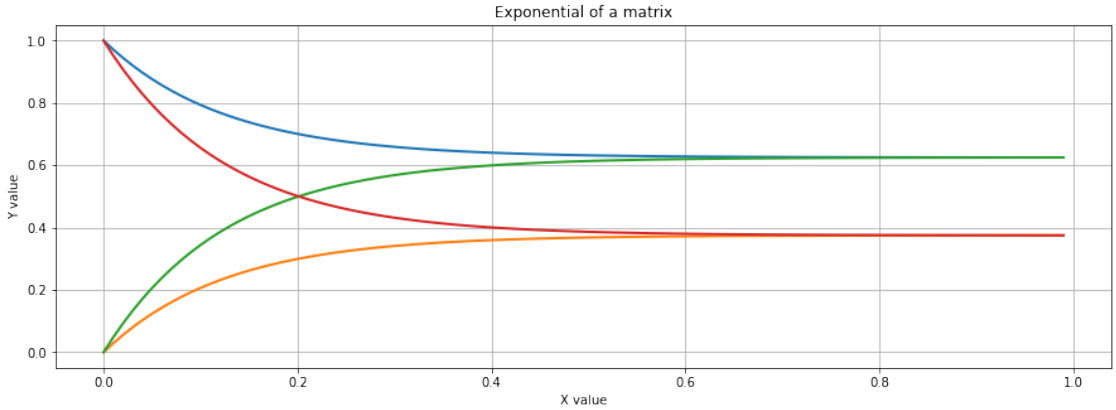
March 12, 2019

In [1]:
```
import numpy as np
import matplotlib.pyplot as plt
from scipy.linalg import expm
```

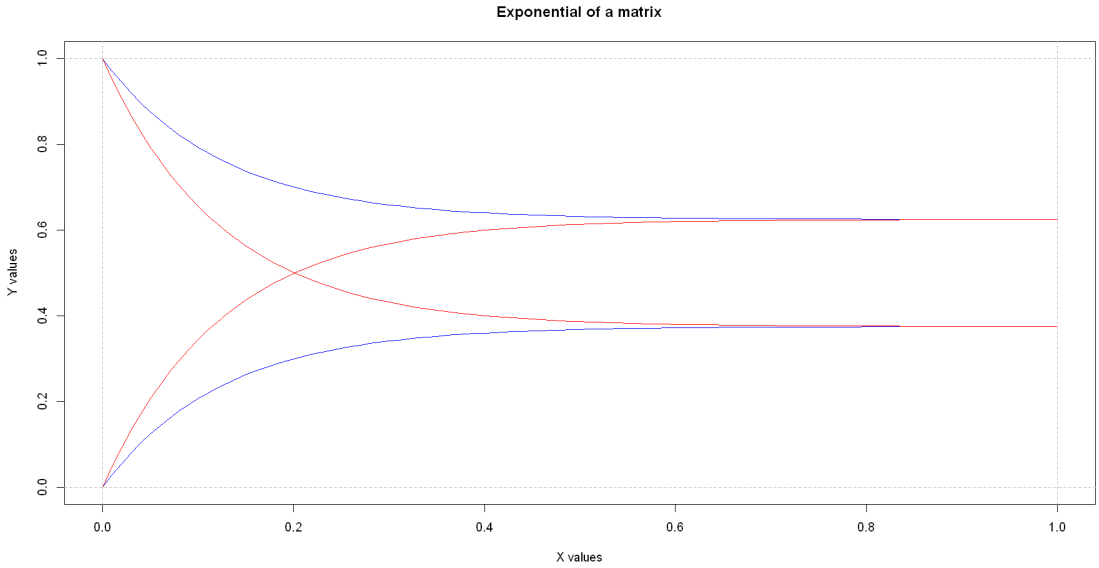
In [2]:
```
matrix = np.mat([[-3,3],[5,-5]])
prec = 0.01

exp = [expm(matrix * i * prec) for i in range(100)]
valx = [i * prec for i in range(100)]
```

In [3]:
```
val1, val2, val3, val4 = [], [], [], []
for mat in exp:
    val1.append(mat[0][0])
    val2.append(mat[0][1])
    val3.append(mat[1][0])
    val4.append(mat[1][1])
```

In [5]:
```
#Create the graph
plt.plot(valx, val1, linewidth = 2)
plt.plot(valx, val2, linewidth = 2)
plt.plot(valx, val3, linewidth = 2)
plt.plot(valx, val4, linewidth = 2)

#Resize the figure
fig_size = plt.rcParams["figure.figsize"]
fig_size[0] = 15
fig_size[1] = 5

#Add the title and the axis caption
plt.title('Exponential of a matrix')
plt.ylabel('Y value')
plt.xlabel('X value')

#Add the grid
plt.grid(True)
```




```
In [1]: mat <- matrix(c(-3,3, 5,-5), nrow = 2, ncol = 2, byrow = TRUE)
        prec = 0.01

In [2]: valx <- c()
        val1 <- c()
        val2 <- c()
        val3 <- c()
        val4 <- c()

In [3]: for (i in (0:100))
        {
            temp <- Matrix::expm(mat*i*prec)
            val1 <- c(val1, temp[1,1])
            val2 <- c(val2, temp[1,2])
            val3 <- c(val3, temp[2,1])
            val4 <- c(val4, temp[2,2])
            valx <- c(valx, i*prec)
        }

In [5]: #Create the graph
        plot(valx, val1, "l", main = "Exponential of a matrix", col = 'blue', xlab = "X values",
        lines(valx, val2, col = 'blue')
        lines(valx, val3, col = 'red')
        lines(valx, val4, col = 'red')

        #Add the grid
        abline(v = 0:173,  lty = 2, col = "grey")
        abline(h = 0:5,  lty = 2, col = "grey")

        #Resize the graph
        options(repr.plot.width=15, repr.plot.height=8)
```


Exponential of a matrix
Y values
X values
0.0
0.2
0.4
0.6
0.8
1.0