Micro project #1

March 12, 2019

1 Python

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)]
```

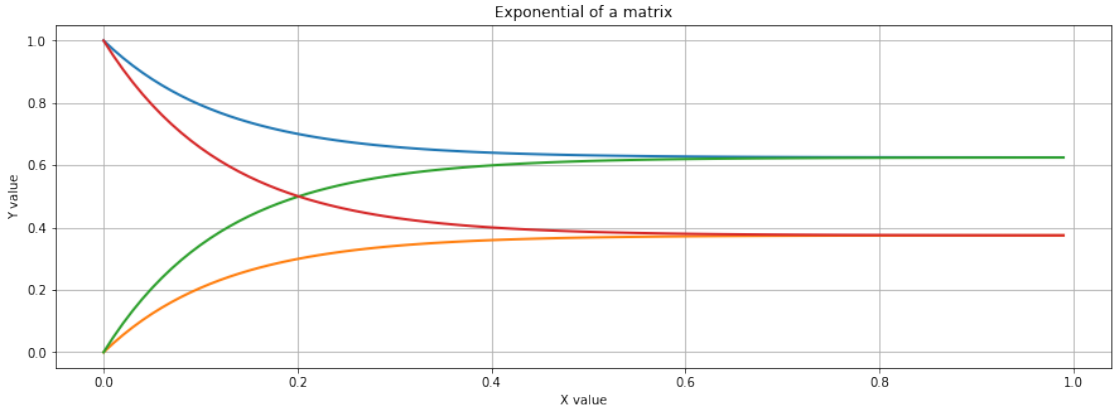
In [3]:
```
val1, val2, val3, val4 = [], [], [], []
for mat in exp:
    val1.append(mat[0][0])
    val2.append(mat[0][1])
    val3.append(mat[1][0])
    val4.append(mat[1][1])
```

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)
```



2 R

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

In [2]: exp <- c()
        valx <- c()
        for (i in (1:100))
        {
            exp <- c(exp,Matrix::expm(mat*i*prec))
            valx <- c(i*prec, valx)
        }

In [4]: val1 <- c()
        val2 <- c()
        val3 <- c()
        val4 <- c()
        for (i in (1:10))
        {
            math = exp[i]
            print(math)
            val1[i] <- c(math[1, 1],val1)
            val2[i] <- c(math[1, 2],val2)
            val3[i] <- c(math[2, 1],val3)
            val4[i] <- c(math[2, 2],val4)
        }
```

```
[[1]]
2 x 2 Matrix of class "dgeMatrix"
           [,1]       [,2]
[1,] 0.97116863 0.02883137
[2,] 0.04805228 0.95194772
```

```
    Error in math[1, 1]: incorrect number of dimensions
Traceback:
```