Question-2

Use RK4, for a step size of 0.05, to solve the equation,

$$\frac{d^2y}{dx^2} + \frac{dy}{dx} = 1 - x \qquad \text{Where} \qquad y(0) = 2, y'(0) = 1$$

In [1]:

```
from My_Lib import*
import numpy as np
import matplotlib.pyplot as plt
import math

e = 2.71828 #BY DEFINITION IN THE QUESTION

# dy/dx = r ; d2y/dx2 = dr/dx
def df_2(x, y, r):# dr/dx=1-x-r
    return 1 - x - r

def df(x, y, r):
    return r

x_sol, y_sol,z = rk_4(df_2, df, 0, 2, 1, 5, 0.05) #calling RK4 with appropiate boundary
conditions
print("The Plot of the solution is ")
plt.title("PLOT OF Y(x) using RK4")

plt.plot(x_sol,y_sol,'b-', label='$step = 0.05$')
x = np.arange(-5, 5, 0.01)
y = 1 + e**(-x) - x**2/2 + 2*x #the boundary condition gives c1=c2=1 #original plot
plt.plot(x,y, 'r-.', label='Analytical Plot')
plt.xlim([-5,5]) #Fixing X limits as given in Question
plt.ylim([-5,5]) #Fixing Y limits as given in Question
plt.xlabel("$x$")
plt.ylabel("$y(x)$")
plt.legend()
plt.show()
```

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