# RUNGE-KUTTA(RK-2) Method

## Program:-

```
#Given equation is:dy/dx=x+y^2 given that x0=0,y(x0)=1;
import matplotlib.pyplot as plt
def f(x,y):
  z=x+y**2
  return z
x0=0
y0=1
h=0.1
X=[]
Y=[]
X.append(x0)
Y.append(y0)
for i in range(0,10):
  k1=h*f(x0,y0)
  k2=h*f(x0+h,y0+k1)
  y1=y0+(k1+k2)/2
  x0+=h
  y0=y1
  X.append(x0)
  Y.append(y1)
  print("When the value of n is",i,"x0=",x0,"y0=",y1)
plt.plot(X,Y,linewidth=2,color="blue")
plt.grid(True)
plt.xlabel("<----x--->")
plt.ylabel("<----y--->")
plt.show()
```

## Output

```
When the value of n is 0 x0= 0.1 y0= 1.1155
When the value of n is 1 x0= 0.2 y0= 1.270833765842635
When the value of n is 2 x0= 0.30000000000000004 y0= 1.4820486253401328
When the value of n is 3 x0= 0.4 y0= 1.7768104862553225
When the value of n is 4 x0= 0.5 y0= 2.2070444937896987
When the value of n is 5 x0= 0.6 y0= 2.8821144595837636
When the value of n is 6 x0= 0.7 y0= 4.074134390866686
When the value of n is 7 x0= 0.7999999999999999 y0= 6.6633788059337276
When the value of n is 8 x0= 0.8999999999999999 y0= 15.221876751444668
When the value of n is 9 x0= 0.9999999999999999 y0= 100.94702402860042
```