

## Generating PDF from CDF

```
import random
import matplotlib.pyplot as plt
import numpy as np
```

```
RV=[]
```

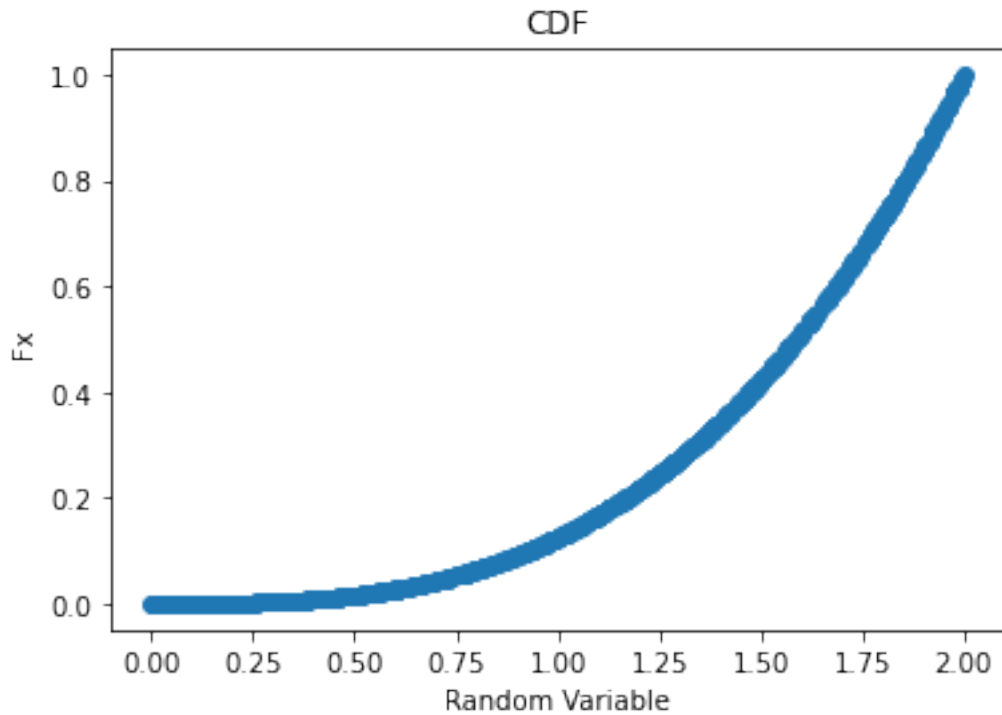
```
for i in range(0,1000):
    x=random.uniform(0,2)
    RV.append(x)
```

```
def CDF(x):
    if x<0:
        return 0
    elif 0<=x<2:
        return x**3/8
    else:
        return 1
```

```
cdf=[]
```

```
for i in range(0,1000):
    Fx=CDF(RV[i])
    cdf.append(Fx)
```

```
plt.scatter(RV,cdf)
plt.title("CDF")
plt.xlabel("Random Variable")
plt.ylabel("Fx")
plt.show()
```

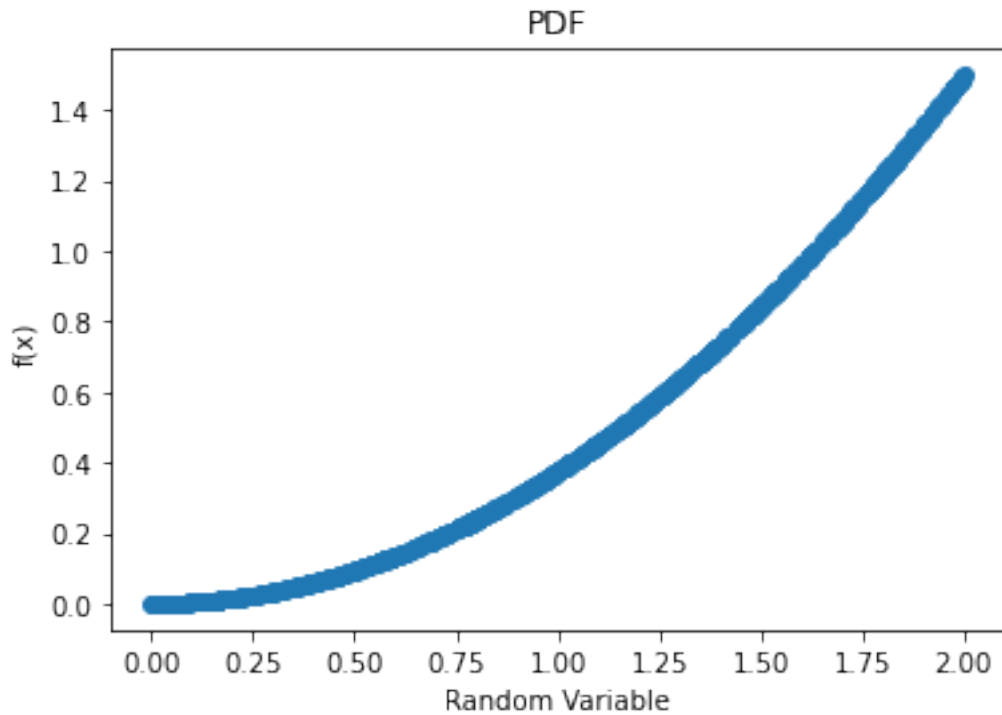


```
from sympy import *
import numpy as np
```

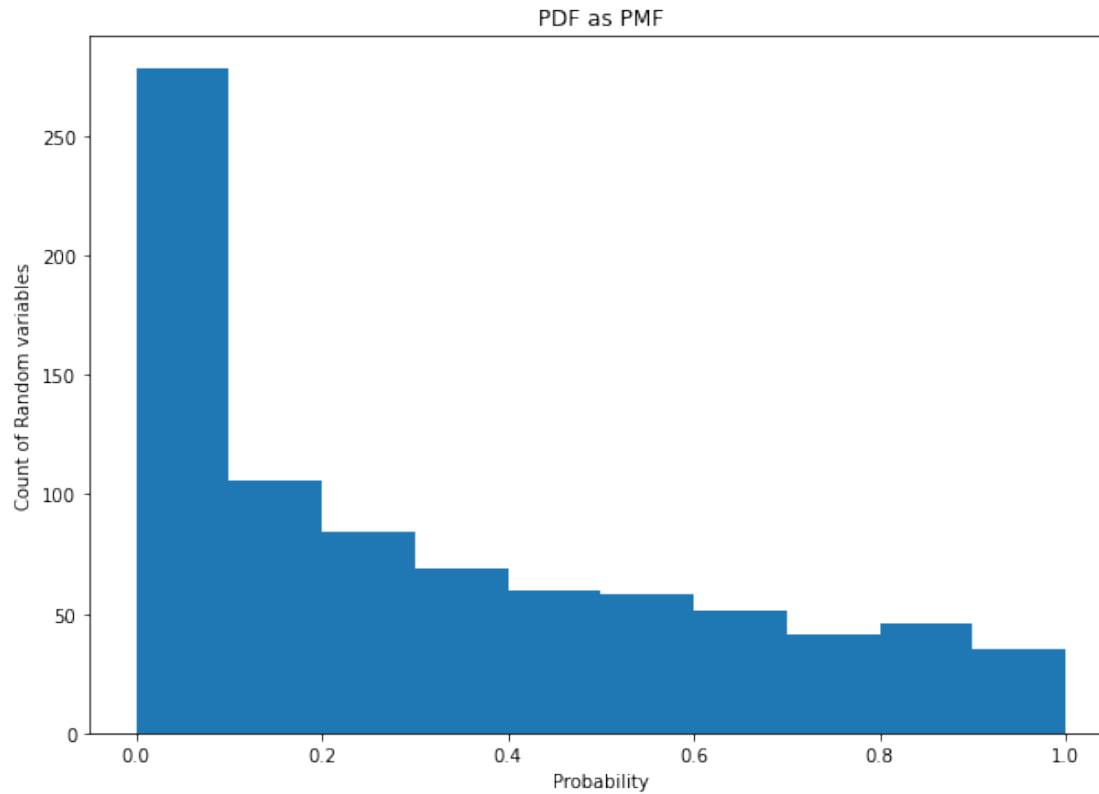
```
def PDF(a):
    if a<0:
        return 0
    elif 0<a<2:
        x=Symbol('x')
        y=x**3/8
        dx=diff(y,x)
        ddx= lambdify(x,dx)
        return ddx(a)
    else:
        return 0
```

```
pdf=[]
for i in range(0,1000):
    fx=PDF(RV[i])
    pdf.append(fx)
```

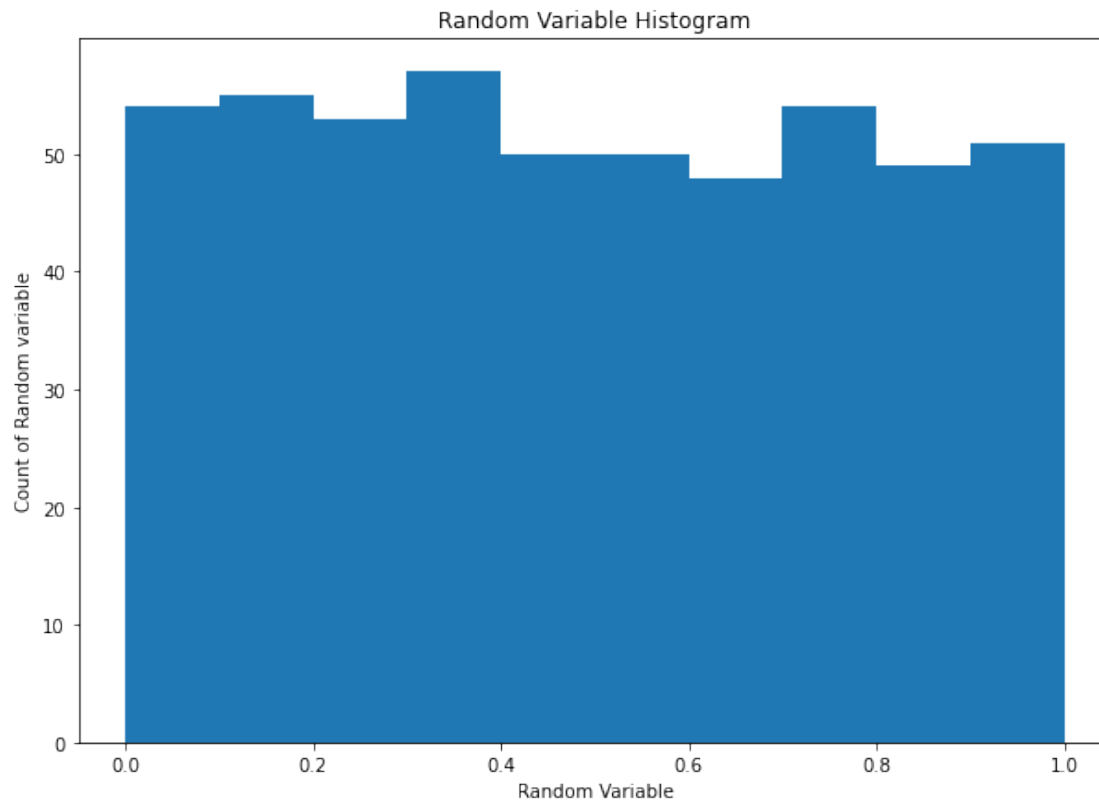
```
plt.scatter(RV,pdf)
plt.title("PDF")
plt.xlabel("Random Variable")
plt.ylabel("f(x)")
plt.show()
```



```
fig, ax = plt.subplots(figsize=(10, 7))
ax.hist(pdf, bins = [0,0.1,0.2,0.3,0.4,0.5,0.6,0.7,0.8,0.9,1])
plt.title('PDF as PMF')
plt.xlabel('Probability')
plt.ylabel('Count of Random variables')
plt.show()
```



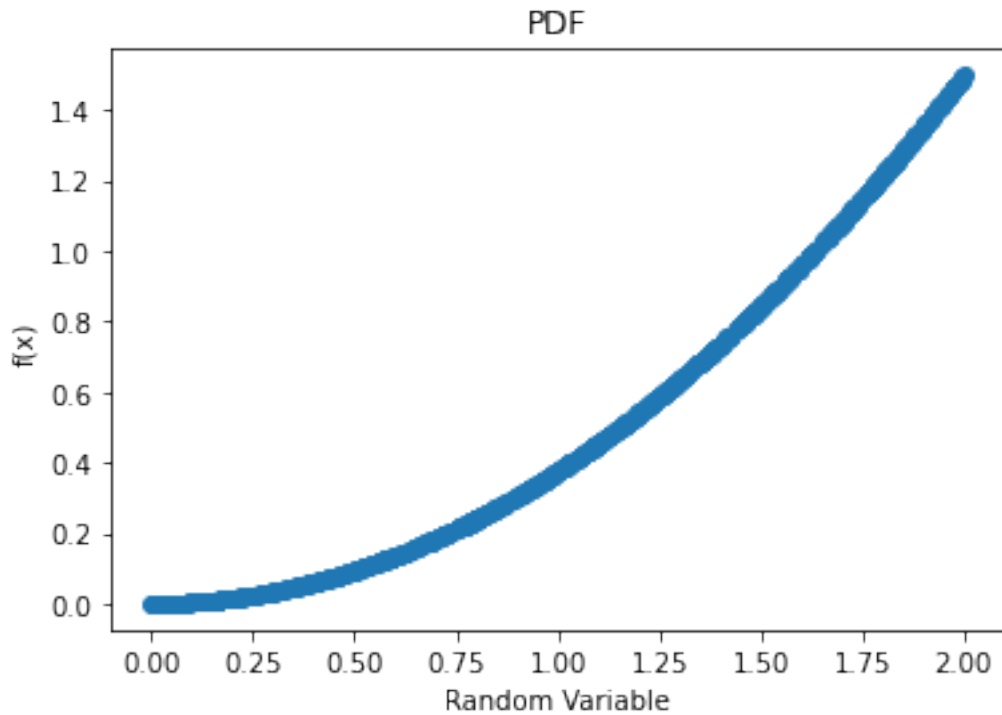
```
fig, ax = plt.subplots(figsize=(10, 7))
ax.hist(RV, bins = [0,0.1,0.2,0.3,0.4,0.5,0.6,0.7,0.8,0.9,1])
plt.title('Random Variable Histogram')
plt.xlabel('Random Variable')
plt.ylabel('Count of Random variable')
plt.show()
```



## Verifying cdf

```
def PDF(x):  
    if x<0:  
        return 0  
    elif 0<x<2:  
        return 3*x**2/8  
    else:  
        return 0
```

```
pdfx=[]  
for i in range(0,1000):  
    fx=PDF(RV[i])  
    pdfx.append(fx)  
plt.scatter(RV,pdfx)  
plt.title("PDF")  
plt.xlabel("Random Variable")  
plt.ylabel("f(x)")  
plt.show()
```

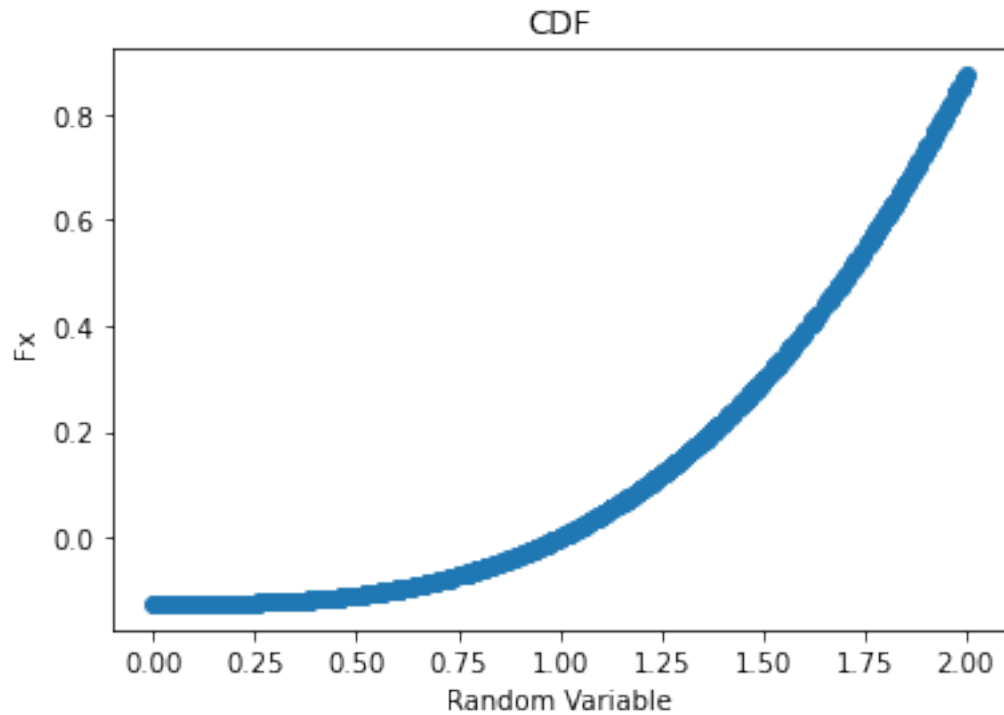


```
from scipy.integrate import quad
```

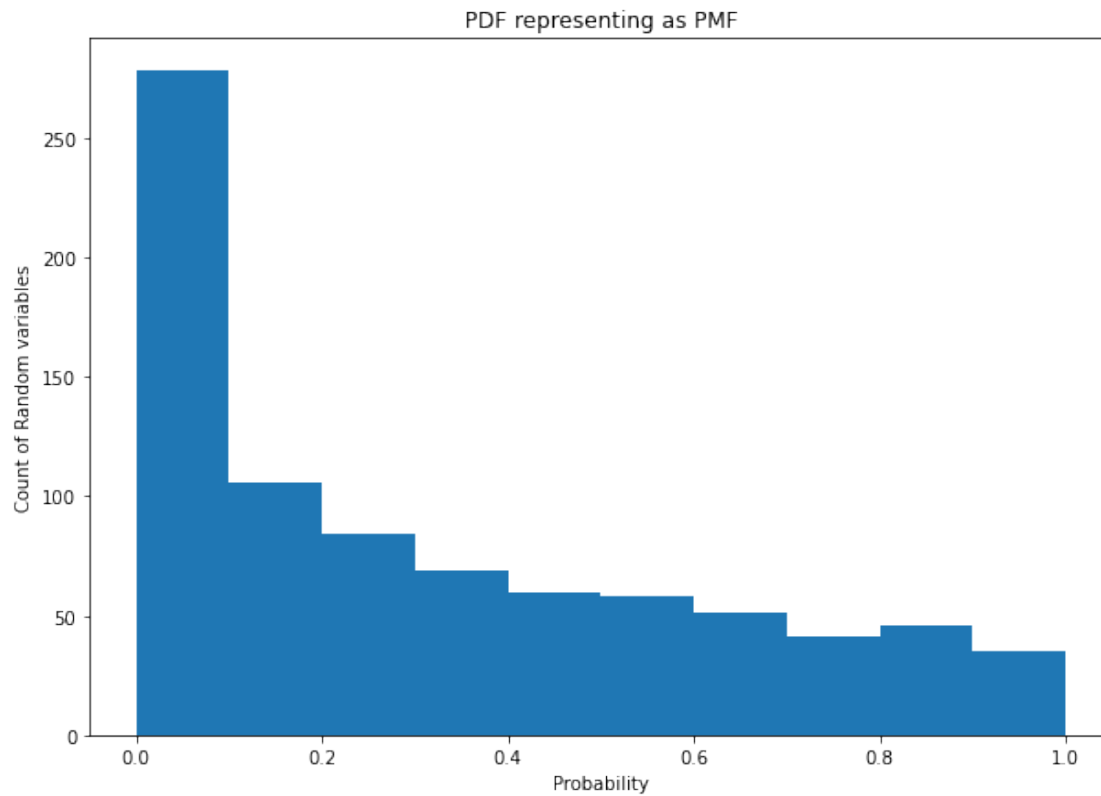
```
def f(x):
    return 3*x**2/8
def CDFx(x):
    if x<0:
        return 0
    elif 0<x<2:
        I, err= quad(f,1,x)
        return I
    else:
        return 1
```

```
cdfx=[]
for i in range(0,1000):
    Fx=CDFx(RV[i])
    cdfx.append(Fx)
```

```
plt.scatter(RV,cdfx)
plt.title("CDF")
plt.xlabel("Random Variable")
plt.ylabel("Fx")
plt.show()
```



```
fig, ax = plt.subplots(figsize=(10, 7))
ax.hist(pdfx, bins = [0,0.1,0.2,0.3,0.4,0.5,0.6,0.7,0.8,0.9,1])
plt.title('PDF representing as PMF')
plt.xlabel('Probability')
plt.ylabel('Count of Random variables')
plt.show()
```



This shows our generated CDF matches above cdf and pdf also matches with the above generated PDF