GAMMA DISTRIBUTION

CODE FOR VARYING K CONSTANT THETA

```
import numpy as np
import matplotlib.pyplot as plt
def factorial(n):
    if n==0:
        return 1
    return n*factorial(n-1)

x=np.arange(0,60, 0.001)
k=1
theta=3
for i in range(4):

    y=(x**(k-1)*np.exp(-x/theta))/(factorial(k-1)*(theta**k))
    plt.plot(x,y,label='k={} theta=3'.format(k))
    k=k+1


plt.ylabel('gamma distribution')

plt.legend()
```

CODE FOR VARYING THETA CONSTANT K

```
import numpy as np
import matplotlib.pyplot as plt
def factorial(n):
    if n==0:
        return 1
    return n*factorial(n-1)

x=np.arange(0,60, 0.001)
k=2
theta=1
for i in range(4):

    y=(x**(k-1)*np.exp(-x/theta))/(factorial(k-1)*(theta**k))
```

```
    plt.plot(x,y,label='theta={} k=2'.format(theta))
    theta=theta+2


plt.ylabel('gamma distribution')

plt.legend()
```

CODE FOR MEAN AND VARIANCE VS K

```
import numpy as np
import matplotlib.pyplot as plt
theta=2
k=np.arange(0.1,10, 0.001)
mean=k*theta
var=k*theta*theta
plt.plot(k,mean,label='mean theta=2')
plt.plot(k,var,label='variance theta=2')
plt.legend()
```

CODE FOR MEAN AND VARIANCE VS THETA

```
import numpy as np
import matplotlib.pyplot as plt
k=1
theta=np.arange(0.1,10, 0.001)
mean=k*theta
var=k*theta*theta
plt.plot(theta,mean,label='mean k=1')
plt.plot(theta,var,label='variance k=1')
plt.legend()
```

CENTRAL LIMIT THEOREM VERIFICATION

```
k=1
theta=1
n=100
ns=10
for i in range(4):
```

```
samplemean=[]
for j in range(ns):
    sum=0

    x = np.random.gamma(1,1,n)
    for k in x:
        sum=sum+k
    samplemean.append(sum/n)
fig, ax = plt.subplots(figsize =(10, 7))
ax.hist(samplemean, bins ='auto')

plt.title("NUMBER OF SAMPLES ={}".format(ns))
plt.show()
ns=ns*10
```