CGS Assignment 1. PAGE NO.:

1.1

a) $\Omega = \{HH, HT, TH, TT\}$

b) $\mathcal{E} = \{\phi, \{HH\}, \{HT\}, \{TH\}, \{TT\}, \{HH, HT\},$
$\{HH, HT\}, \{HH, TH\}, \{HH, TT\}, \{HT, TH\}, \{HT, TT\},$
$\{TH, TT\}, \{HH, HT, TH\}, \{HH, HT, TT\}, \{HH, TH, TT\},$
$\{HT, TH, TT\}, \{HH, HT, TH, TT\}\}$

c) i) $P(HH) = P(HT) = P(TH) = P(TT)$

$P(\Omega) = 1$

$\therefore P(HH) = P(HT) = P(TH) = P(TT) = 1/4$

ii) $P(HH) + P(HT) + P(TH) = 3/4$

iii) $P(HT) + P(TH) = 1/2$

2.1 $\dfrac{50!}{45!\,5!} \times (0.9)^{45} (0.1)^{5}$

$= \dfrac{50 \times 49 \times 48 \times 47 \times 46}{5!} \times 0.9^{45}\, 0.1^{5}$

≈ 0.185

2.2. a) $f(0,10) = \dfrac{10^0 e^{-10}}{0!} = \dfrac{1}{e^{10}} \approx 4.8 \times 10^{-5}$

b) $f(8,10) + f(9,10) = \dfrac{10^8 e^{-10}}{8!} + \dfrac{10^9 e^{-10}}{9!}$

≈ 0.254

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3.1 a) $f(0) = \frac{1}{1\sqrt{2\pi}} e^{-\frac{(0-1)^2}{2 \cdot 1^2}}$

$= \frac{1}{\sqrt{2\pi}} e^{-1/2}$

$= \frac{1}{\sqrt{2\pi e}} \approx 0.24$

b) $f(1) = \frac{1}{1\sqrt{2\pi}} e^{-\frac{(1-0)}{2 \cdot 1^2}} \approx 0.24$

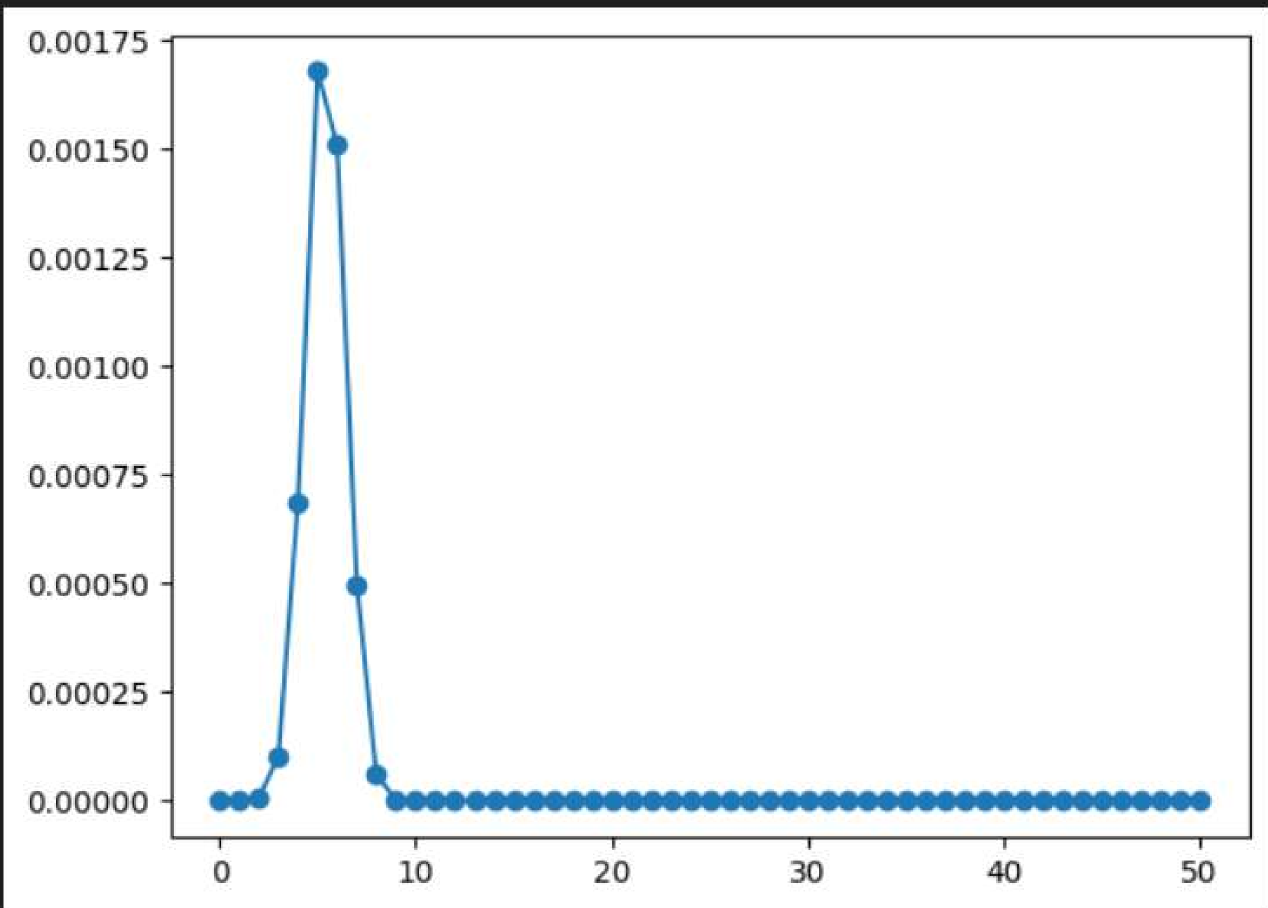
c) $P(x_2 \leq X \leq x_3) = P(x_1 \leq X \leq x_3) - P(x_1 \leq X \leq x_2)$

$= 0.15$

4.1(A)

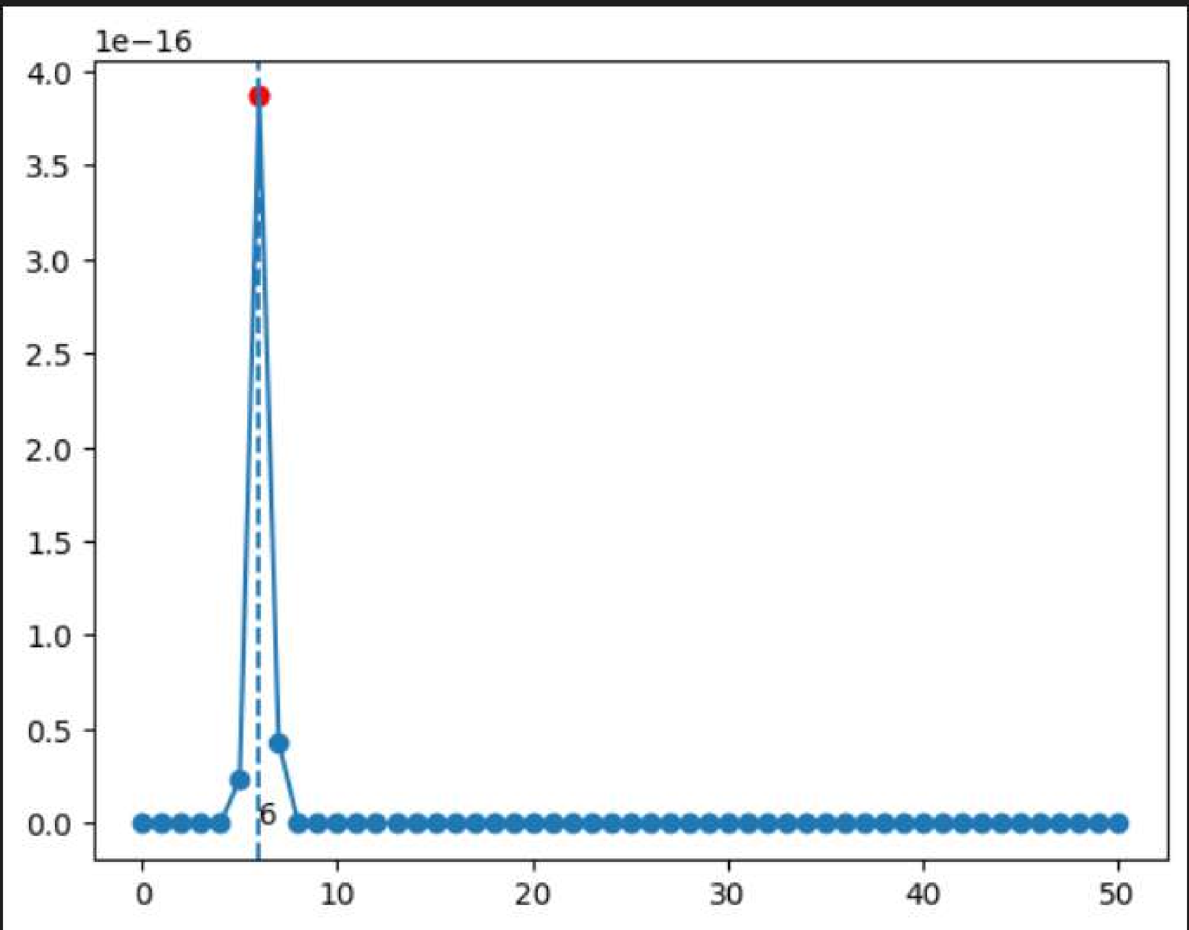
```
from math import e, log
import matplotlib.pyplot as plt
x = []
y = []
for i in range(51):
    x.append(i)
    compute = (1 / (220 * (2 * 3.14)**(1/2)) * e**((-(log(220) - i)**2) / 2))
    y.append(compute)
plt.plot(x, y)
plt.scatter(x, y)
plt.show()
```

2] ✓ 0.0s



4.1 (B,C)

```
from math import e, log
import matplotlib.pyplot as plt
x = []
y = []
for i in range(51):
    x.append(i)
    compute=1
    for j in [303.25, 443, 220, 560, 880]:
        compute = (1 / (j * (2 * 3.14)**(1/2)) * e**((-(log(j) - i)**2) / 2))*compute
    y.append(compute)
max_index = y.index(max(y))
maxx = x[max_index]
maxy = y[max_index]
plt.axvline(x=maxx, linestyle='--')
plt.plot(x, y)
plt.scatter(x, y)
plt.scatter(maxx, maxy, color='red')
plt.text(maxx, 0, f'{maxx}')
plt.show()
```



2.2 (C)

```
from math import factorial
import matplotlib.pyplot as plt
x=[]
y=[]
e=1
for i in range(10):
    e=e*2.7
for i in range(51):
    x.append(i)
    compute=(10**i)/(factorial(i)*e)
    y.append(compute)

plt.plot(x,y)
plt.scatter(x,y)
```

[4]

```
<matplotlib.collections.PathCollection at 0x22c0e1c95d0>
```