ECE 314 2020fa Quiz 1

ZJU-UIUC institute Zhejiang University
Fall 202[redacted]
Name:
Student Number:

1.(15pts) Look at the following code segments. Write down the output generated by these codes. If the code throws an error, write "Error" and explain why.

(i)(5pts)

```
5+4**(3/2)
```

13.0

(ii)(5pts)

```
import numpy as np
x = np.linspace(-3, 3, 7)
print(x)
```

[-3, -2, -1, 0, 1, 2, 3]

(iii)(5pts)

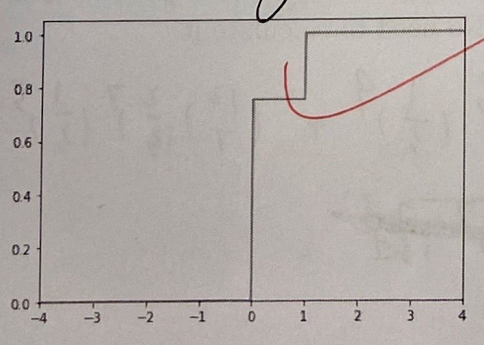
```
import numpy as np
A = np.array([1, 2, 3], [4, 5, 6])
print(A.T)
```

error.
Since we need to write np.array([[1,2,3],[4,5,6]]) the provided code lose two bracelets

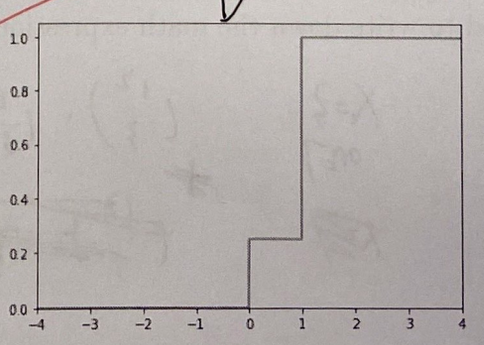
2.(20pts) Match the following graphs of PMF and CDF of Bernoulli Distribution to the appropriate option.

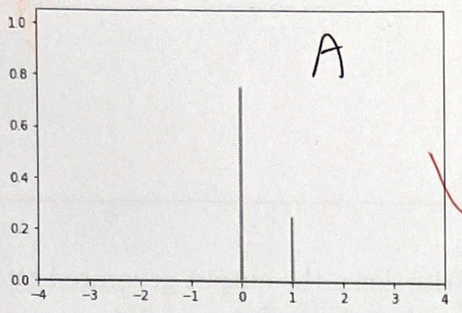
A. PMF of st.bernoulli(0.25)
B. PMF of st.bernoulli(0.75)
C. CDF of st.bernoulli(0.25)
D. CDF of st.bernoulli(0.75)

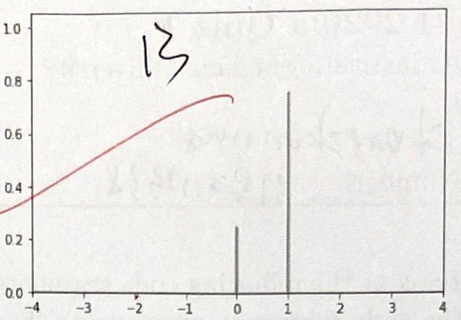
C



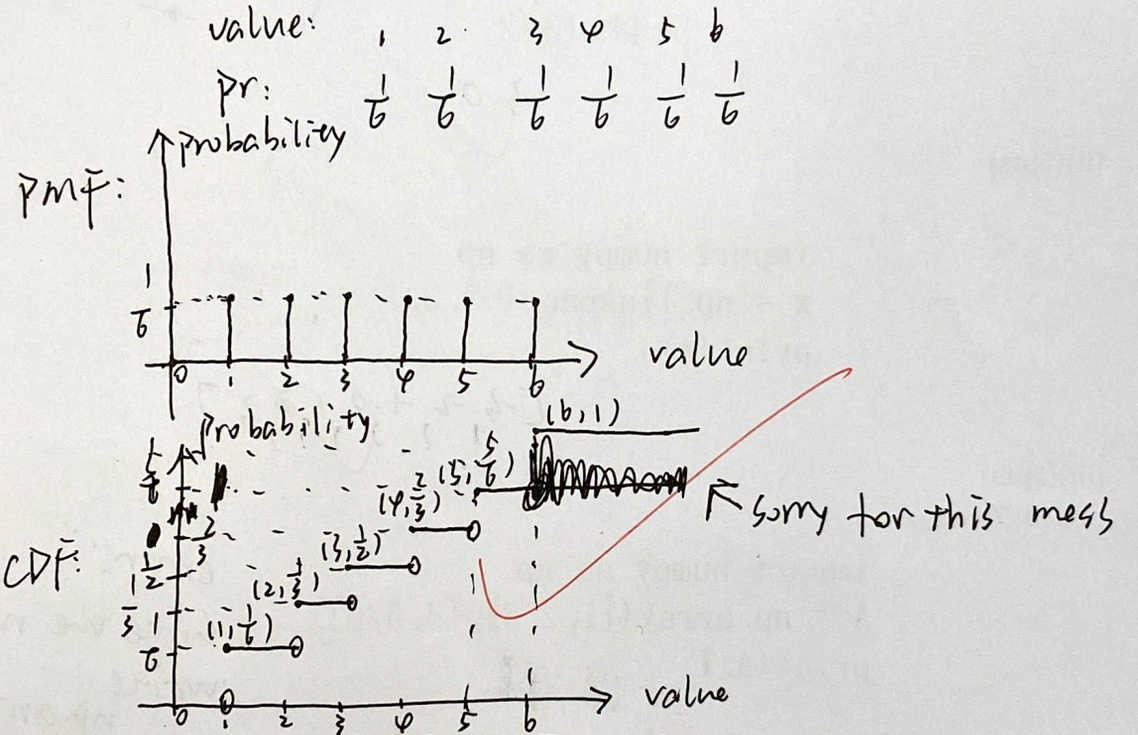
D







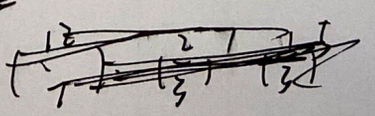
3.(20pts) Sketch the PMF and CDF of a random variable representing the number generated by tossing a fair die. Clearly label the axes of your graphs.



4.(15pts) You are given a biased coin. Tossing the coin once gives you a Head with probability 1/3. You toss the coin 12 times. Let X denote the total number of Tails you get.

- What are the possible values of X? $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$
- What is the formula to calculate $\binom{n}{k}$? $\binom{n}{k} = \frac{n!}{k!(n-k)!}$
- Find the probability that X is 3 or 7. Hint: $p_n(k) = \binom{n}{k} p^k (1-p)^{(n-k)}$. You only need to write down the math expression. No need to calculate it.

$X=3$ or 7: $\binom{12}{3}\left(\frac{2}{3}\right)^3\left(\frac{1}{3}\right)^9 + \binom{12}{7}\left(\frac{2}{3}\right)^7\left(\frac{1}{3}\right)^5$



0, 1.

5.(15pts) np.random.rand() returns a uniformly distributed number between 0 and 1. Write a piece of code with one line that returns a uniformly distributed number between -100 and 100 using np.random.rand().

(200 * np.random.rand(1)) - 100

6.(15pts) Why changing the linspace from 1001 to 1000 will result the PMF/CDF plot to disappear? (in the lab)

since the variable we encountered is bernoulli variable.
it only has non-zero probability at 0 and 1.

so if we set 1001, the interval is $\frac{a}{1000}$ ⇒ some integer ⇒ 0, 1 will be covered

change to 1000, interval is $\frac{a}{999}$ ⇒ 0, 1 will not be covered

⇒ all in all, when only 1000 points, ⇒ all 0

some non-zero points may not be involved in linspace! (like 0 and 1)