Score: _____ / **15**

PSTAT 5A / **MIDTERM EXAM 2** / Sum. Sess. A 2023 Instructor: **Ethan Marzban**

Name:_____ **UCSB NetID:**_____
First, then Last *NOT your Perm Number!*

Circle Your Section: Olivier 12:30 - 1:20pm Mengrui 2 - 2:50pm Mengrui 3 - 3:50pm

MULTIPLE CHOICE QUESTIONS VERSION A

Instructions:

- You will have **75 minutes** to complete the entire exam
  - Do not begin working on the exam until instructed to do so.
  - During the final 10 minutes of the exam, we will ask everyone to remain seated until the exam concludes.
- This exam comes in **TWO PARTS**: this is the **MULTIPLE CHOICE** part of the exam.
  - There is a separate booklet containing Free-Response questions that should have been distributed to you at the same time as this booklet.
- Fill in the bubble corresponding to your answer **on the provided scantron**; **Absolutely NOTHING** written directly on this exam booklet will be graded. Partial credit will **not** be awarded.
  - Unless explicitly instructed otherwise, mark only one answer per question. If you mark multiple answers for the same question, you will receive 0 points for the question even if one of your choices is correct.
- The use of calculators is permitted; the use of any other aids (including notes, laptops, phones, etc.) is strictly prohibited. A list of formulae, as well as a collection of tables, is included with this exam.
- **PLEASE DO NOT DETACH ANY PAGES FROM THIS EXAM.**
- Good Luck!!!

VERSION A

Problems 1 - 4 refer to the following stiuation: Alan would like to plot the function $f(x) = xe^{-x^2}$, between $x = 0$ and $x = \pi$. To that end, he has written the following code, and has nothing written before it:

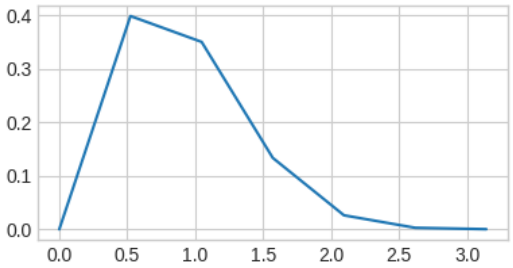
```
%matplotlib inline
import matplotlib
import matplotlib.pyplot as  Blank 1
plt.style.use('seaborn-v0_8-whitegrid')

 Blank 2  numpy  Blank 3  np

def f(x):
    """
    return x * e^(-x^2)
    """
    return x * np.exp(- (x ** 2))

xnew = np.linspace(0, np.pi, 7)
plt.plot(xnew, f(xnew));
```

This code, after filling in the blanks appropriately, has resulted in the following output:



Problem 1. What should go in Blank 1? [1pts.]

A. `matplotlib.pyplot`

B. `pyplot`

C. `plt`

D. `mtpltlbpplt`

E. None of the above

Problem 2. What should go in Blank 2? [1pts.]

A. `import`

B. `load`

C. `store_module`

D. `*`

E. None of the above

Problem 3. What should go in Blank 3? [1pts.]

A. `*`

B. `as`

C. `if`

D. `elif`

E. None of the above

Problem 4. Note that the resulting plot is quite "jagged." Alan would like to fix that, and make the resulting plot smoother without changing the $x-$ and $y-$limits of the plot. Which of the following will achieve that? [1pts.]

A. Change the `np.pi` in his call to `np.linspace()` to a larger number; e.g. `100`.

B. Change the `0` in his call to `np.linspace()` to a larger number; e.g. `100`.

C. Change the `7` in his call to `np.linspace()` to a larger number; e.g. `100`.

D. None of the above

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Problems 5 - 8 refer to the following situation: Shivani would like to write a function called `num_even()` that takes in a single list input `x` and returns the number of even elements in `x`. She has written the following skeleton code (assume she has nothing written before this code):

```
def num_even(x):

    """
    return the number of even elements in a list x
    """

    count = __Blank 1__

    for k in x:

        if __Blank 2__ % 2 == 0:

            __Blank 3__ += 1

        else:

            count += 0

    return __Blank 4__
```

VERSION A

Problem 5. What should go in Blank 1? [1pts.]

A. `0`

B. `1`

C. `2`

D. `3`

E. None of the above

Problem 6. What should go in Blank 2? [1pts.]

A. `x`

B. `k`

C. `count`

D. `even_count`

E. None of the above

Problem 7. What should go in Blank 3? [1pts.]

A. `x`

B. `k`

C. `count`

D. `even_count`

E. None of the above

Problem 8. What should go in Blank 4? [1pts.]

A. `x`

B. `k`

C. `count`

D. `even_count`

E. None of the above

. . . . . .

Problems 9 - 11 refer to the following situation: Consider the random variable X with the following probability mass function (p.m.f.):

k	-1	0	1	2
$\mathbb{P}(X = k)$	0.2	0.5	0.05	a

for some as-of-yet unknown constant a.

Problem 9. What must be the value of a? [1pts.]

A. 0.15

B. 0.25

C. 0.50

D. 0.75

E. None of the above

Problem 10. Suppose $a = 0.25$ (which is not to say this is the correct answer to Problem 9 above!) What is the value of $\mathbb{E}[X]$, the expected value of X? [1pts.]

A. 0.05

B. 0.15

C. 0.25

D. 0.35

E. None of the above

Problem 11. Suppose $a = 0.25$ (which is not to say this is the correct answer to Problem 9 above!) and that $\mathbb{E}[X] = 0.35$ (which is not to say this is the correct answer to Problem 10 above!) What is $\text{Var}(X)$? [1pts.]

A. 1.1275

B. 1.2500

C. 1.3725

D. 1.6000

E. None of the above

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Problems 12 - 15 refer to the following stiuation: Suppose that Mehr has imported the `scipy.stats` module with the nickname `sps`, and also imported the `numpy` module with the nickname `np`.

Problem 12. Approximately what value would be returned by the running the command `sps.norm.ppf(0.0351)`? [1pts.]

A. -1.81

B. -2.11

C. 1.81

D. 2.11

E. None of the above

Problem 13. Approximately what value would be returned by the running the command `sps.t.cdf(1.33, df = 20)`? [1pts.]

A. 0.010

B. 0.100

C. 0.200

D. 1.330

E. None of the above

Problem 14. Suppose Mehr runs the command [1pts.]

```
np.random.choice(np.arange(7), size = 10)
```

Which of the following best describes what this code is doing?

A. Simulates rolling a 7-sided die once

B. Simulates rolling a 6-sided die once

C. Simulates rolling a 10-sided die 7 times

D. Simulates rolling a 6-sided 10 times

E. None of the above

Problem 15. Suppose Mehr now runs the following lines of code: [1pts.]

```
a = sps.norm.ppf(0.1)
b = sps.norm.ppf(0.9)
```

Which of the following correctly describes the relationship between the values of `a` and `b`?

A. `a = 1 - b`

B. `b = 1 - a`

C. `a = -b`

D. `a + b = 1`

E. None of the above.