2025 Spring MATH 9, MIDTERM 2

Sample Midterm

Note: this is neither an official nor a complete version of the Midterm 2.

Name: _____

Student ID: _____

Instructions: This is an in-class, 50-minute, written exam. Notes/computers/mobile phones/communication/etc., are not allowed. Your work will be graded on clarity as well as correctness. Clearly indicate your final answers and cross out incorrect work. Do work in the space provided. Good luck.

1. Answer the following questions (short answers).

(1). Determine the output of the following Python function when $x = [1, 2, 4]$ and $y = [2, 1, 2]$. Clearly indicate your answer.

```
def mymatrix(x,y):
    A = []
    for i in range(len(x)):
        if x[i]!=y[i]+1:
            A.append(x[i])
        else:
            A.append(y[i]**2)
    return A
```

(2). What is the output of the following code? And what is the data type of the output?

```
mylist = [1,2,3,4,3,2,1]
[x if x >= 3 else x%2 for x in mylist]
```

(3). (Write Python code) Use Numpy to create the following 4-by-3 matrix: the element at the i-th row (index i) and j-th column (index j) have value $i * j$.

```
import numpy as np
```

(4). What is the output of the following Python code? Justify your answer.

```
f = lambda x,y: (x * y) ** 2 + y % 2
print(f(2,3))
```

2. Please select the best answer (one option) for each question below. Write down your answers in the table.

(1)	(2)	(3)	(4)	(5)

(1). If $a = [2, 1]$ is a Python list, what is the output of the following Python code?

```
a*2
```

A. [4, 2]
B. [2, 1, 2, 1]
C. [2, 1, 2]
D. None of above

(2). What is the output from the following code?

```
a = 3
b = (a != 3)
print(b)
```

A. True
B. False
C. 3
D. Syntax error

(3). What is the output of the following Python code?

```
import numpy as np
a = np.array([[1,2,3],[0,1,4]])
b = np.zeros((2,3), dtype=np.int16)
c = np.ones((2,3), dtype=np.int16)
d = a + b + c
print(d[:,2])
```

A. [4 5]
B. [2 3 4]
C. [3 2]
D. None of above

(4). What will be the output of the following Python function:

```
import numpy as np
rng = np.random.default_rng()
rng.integers(3.5,7)
```

A. Syntax error
B. Any integer between 3.5 and 7, including 7
C. Any integer between 3.5 and 7, excluding 7
D. The integer closest to the mean of 3.5 and 7

3. Consider the following function, and assume the inputs are always positive integers:

```
def fun1(n,m):
    p=0
    e=0
    while e<m:
        p=p+n
        e=e+1
    return p
```

(1). If we input $n = 4$ and $m = 3$, what are the values of p and e at the end of each iteration of the loop? List all the values including their initial values.

4. Consider the following Python code, what is the output?

```
def blue(x):
    y = orange(x)
    return y - orange(x+2)

def red(y):
    x = 2
    return blue(orange(y)+x)

def orange(x):
    return x+5

x = 4
y = 3

print(red(orange(y)))
print(x)
print(y)
```