Question 1

What is the matrix representation of $A$ after the following code is run?

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

Question 2

Given the 2D array (i.e., matrix)

$$A = \begin{bmatrix}
1 & 2 & 3 & 4 \\
2 & 3 & 4 & 5 \\
3 & 4 & 5 & 6
\end{bmatrix},$$

which of the following expressions generates

$$B = \begin{bmatrix}
2 & 3 & 4 \\
4 & 5 & 6
\end{bmatrix}$$

?

```python
# option 1
B = A[[0, 2], 1:]
# option 2
B = A[:, :]
# option 3
B = A[[1, 3], 2:]
# option 4
B = A[1:, [0, 2]]
# option 5
B = A[[0, 2], 2:]
```

Question 3

Suppose you have a script that contains the line

```python
A = np.array([[1, 2, 3]])
```
but when you run it, the following error occurs:

```
Traceback (most recent call last):
  File "<stdin>", line 1, in ...
NameError: name 'np' is not defined
```

What is causing the error? How do you correct it?

**Question 4**

Given that numpy is imported as np, and that you have defined the one-dimensional array

\[ a = \begin{bmatrix} 1 & 2 & 3 & 4 \end{bmatrix} \]

which of the following commands will not raise an error? Check all that apply.

```python
# option 1
b = np.ones((5, 5))
# option 2
b = np.ones(5, )
# option 3
b = a[:2]
# option 4
b = a[4:]
# option 5
b = a[:5]
# option 6
b = np.ones(5, 5)
# option 7
b = a[4]
# option 8
b = a[:2, :2]
```

**Question 5**

Given that numpy is imported as np, which of the following lines of code generates an array \( \chi \) of 100 random numbers between 0 and 1?
# option 1
x = np.random(100)
# option 2
x = random(100)
# option 3
x = np.random.rand(100)

**Question 6**

Suppose $x$ is an array of 100 random numbers between 0 and 1. Which piece of code sets to 1 all elements of $x$ that are greater than 0.5?

```python
# option 1
[x > 0.5] = 1
# option 2
x[x > 0.5] = 1
# option 3
x[> 0.5] = 1
# option 4
if x > 0.5: x = 1
```

**Question 7**

Which piece of code returns the numerical indices of the first three elements of the one-dimensional array $x$ that are greater than 1?

```python
# option 1
(x > 1)[:3]
# option 2
(x > 1).nonzero()[0][:3]
# option 3
x[x > 1][:3]
# option 4
x[:3] > 1
```

**Question 8**
What piece of code loads the file 'data.pickle', which contains a dict object, into the variable "data"? You can assume that the directory containing 'data.pickle' is in your path (i.e., is accessible).

*The end result should be that the variable data is a dict object.

```python
# option 1
import pickle
with open('data.pickle', 'rb') as f:
    data = pickle.load(f)

# option 2
import pickle
data = pickle.open(f, 'rb')

# option 3
import pickle
with open('data.pickle', 'rb') as f:
    data = f

# option 4
import pickle
with open('data.pickle', 'rb') as f:
    data = f.open()
```

**Question 9**

Suppose the dict called "data" has been set to {'a': 3, 'c': 9, 'b': 5}. How do you set the value corresponding to the key 'b' to 100?

```python
# option 1
data['b'] = 100
# option 2
data('b') = 100
# option 3
data.b = 100
# option 4
set(data, b, 100)
```
Question 10

Which plot results when you run the following code?

```python
import numpy as np
import matplotlib.pyplot as plt

x = np.arange(0, 5, step=0.05)
y = np.sin(x**2)
plt.plot(x, y)
plt.show()
```

option 1

![Plot 1](image1)

option 2

![Plot 2](image2)
option 3

option 4
Question 11

Given the array $x = \text{np.array([1,2,3,4,5])}$, how do you create an array $y$ that contains the cubes of all the elements of $x$?

```python
# option 1
y = x**3
# option 2
y = x^3
# option 3
y = x.^3
```

Question 12

What is the mathematical representation of $x$ after this sequence of commands?
import numpy as np
x = np.array([[1, 2, 3], [2, 3, 4]])
x *= 5
x -= 1
x[x > 10] = 0
x = x.T

Question 13

Which of the following pieces of code sets the value of y to True if the value of x is either 2, 5, or 9, and to False otherwise? Check all that apply.

# option 1
if x in [2, 5, 9]:
    y = True
else:
    y = False

# option 2
y = False
if x in [2, 5, 9]:
    y = True

# option 3
if x == [2, 5, 9]:
    y = True
else:
    y = False

# option 4
y = x in [2, 5, 9]

Question 14

What does the statement
import pdb; pdb.set_trace()

do when placed inside a python script?

Option 1: Halts the program until the user presses a key on the keyboard.

Option 2: Interrupts execution and temporarily gives control to the user.

Option 3: Saves all of variables to a file called "pdb".

Option 4: Prints all of the local data to the console.