Question 1

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

```
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

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

?

```
# 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

```
A = np.array([1, 2, 3])
```

but when you run it, the following error occurs:

```
Traceback (most recent call last):
  File "&lt;stdin&gt;", line 1, in &lt;module&gt;
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.

```
# 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 x 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?

```
# 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?

```
# 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.

```
# 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?

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

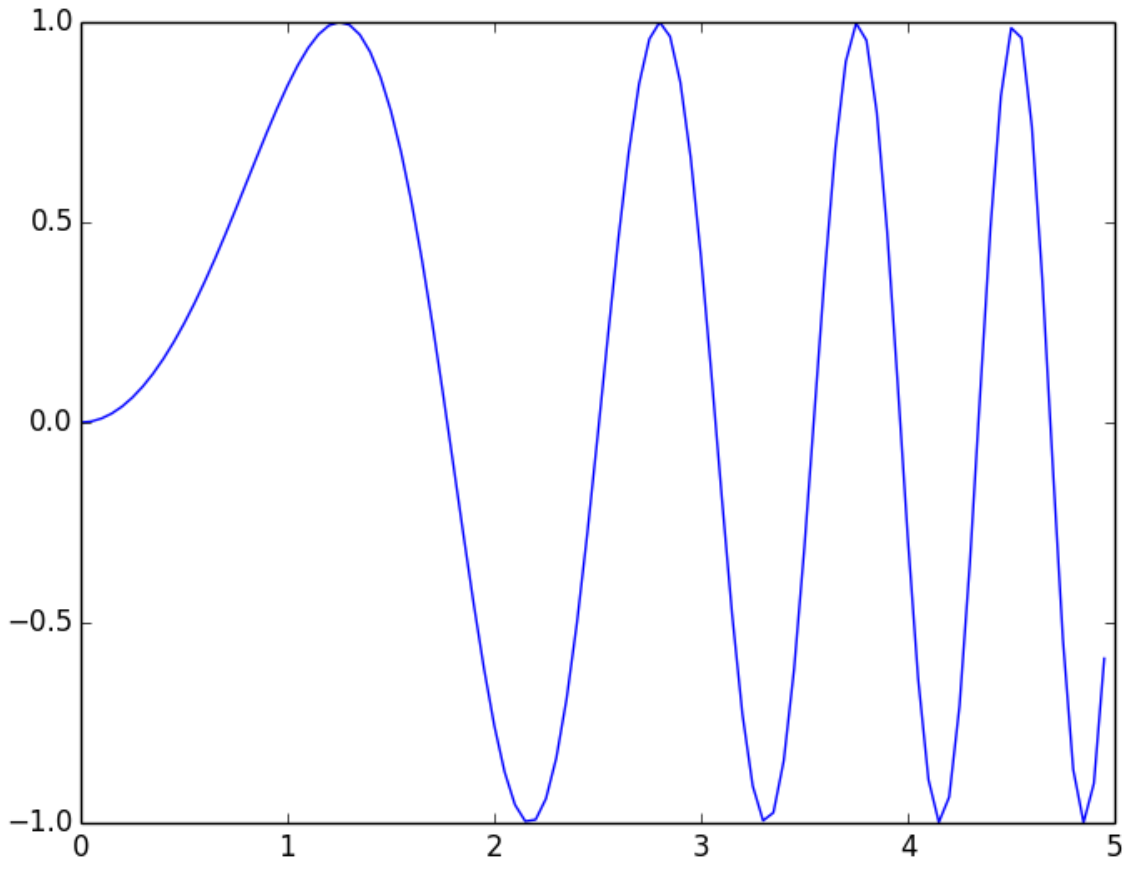
Question 10

Which plot results when you run the following code?

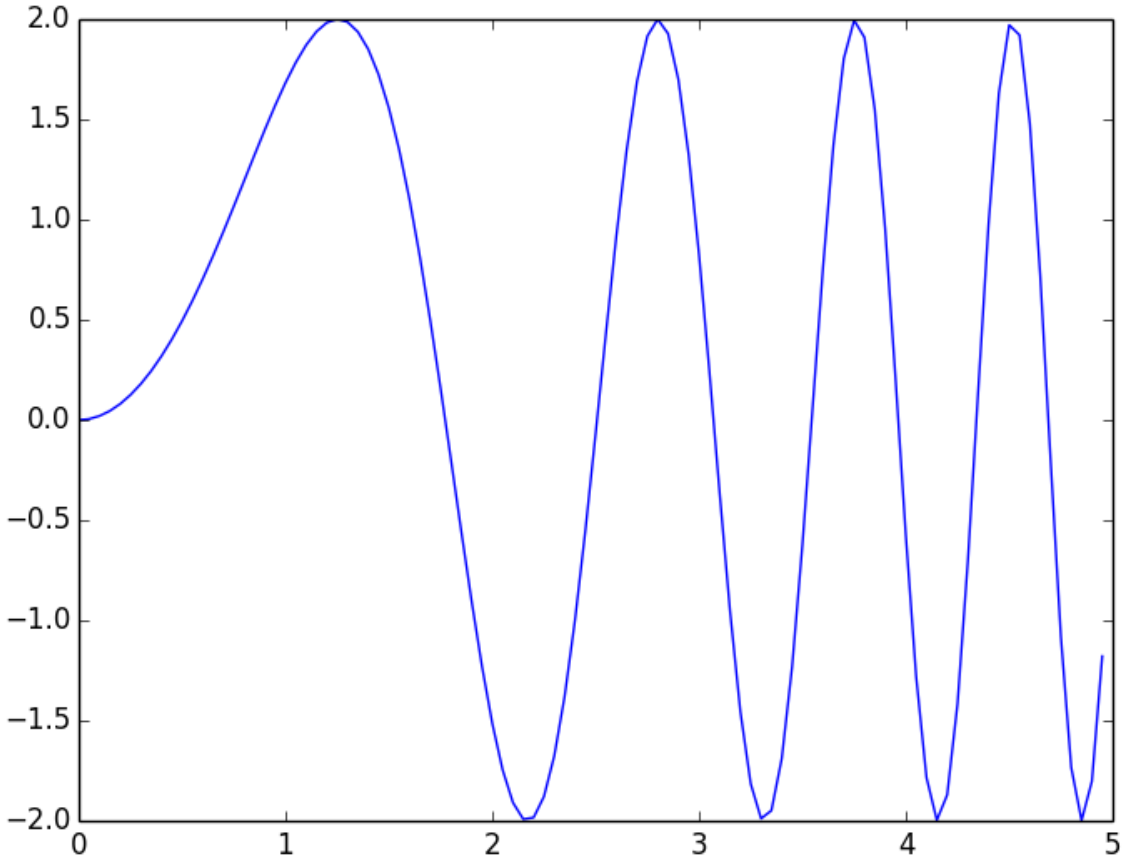
```
import numpy as np
import matplotlib.pyplot as plt

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

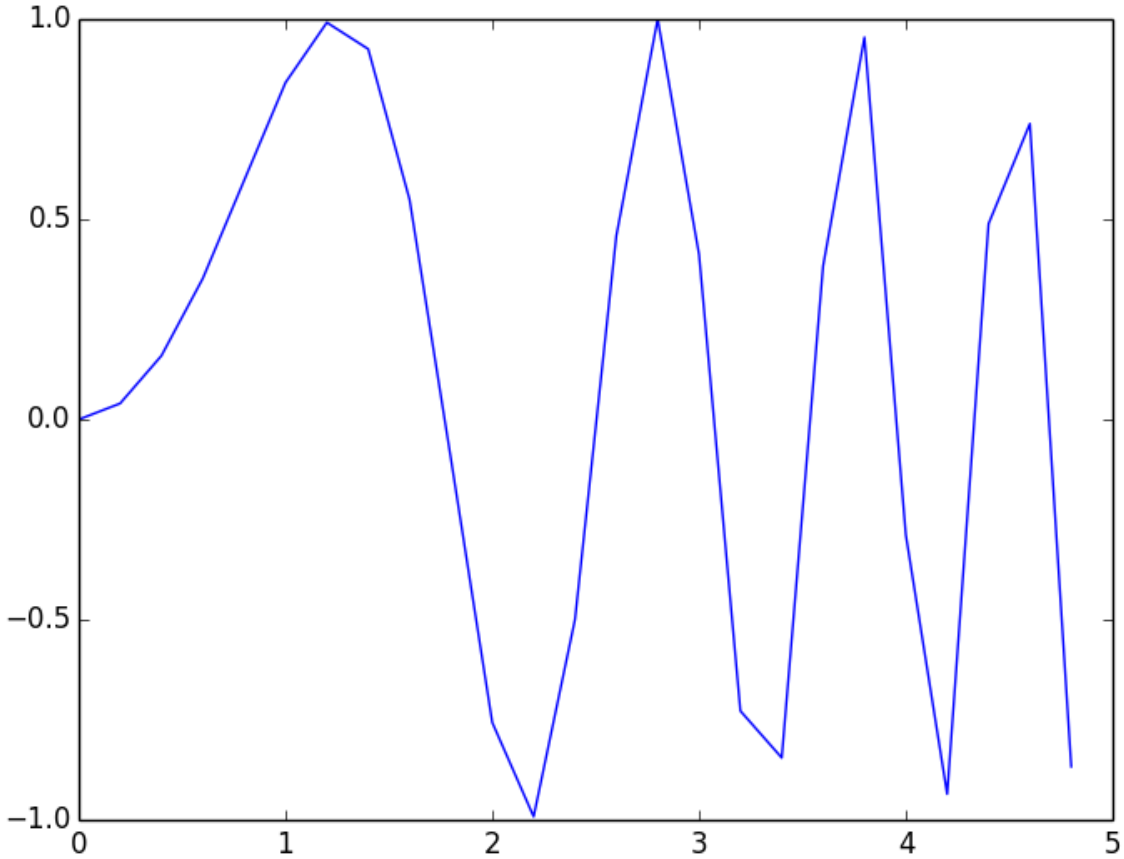
option 1



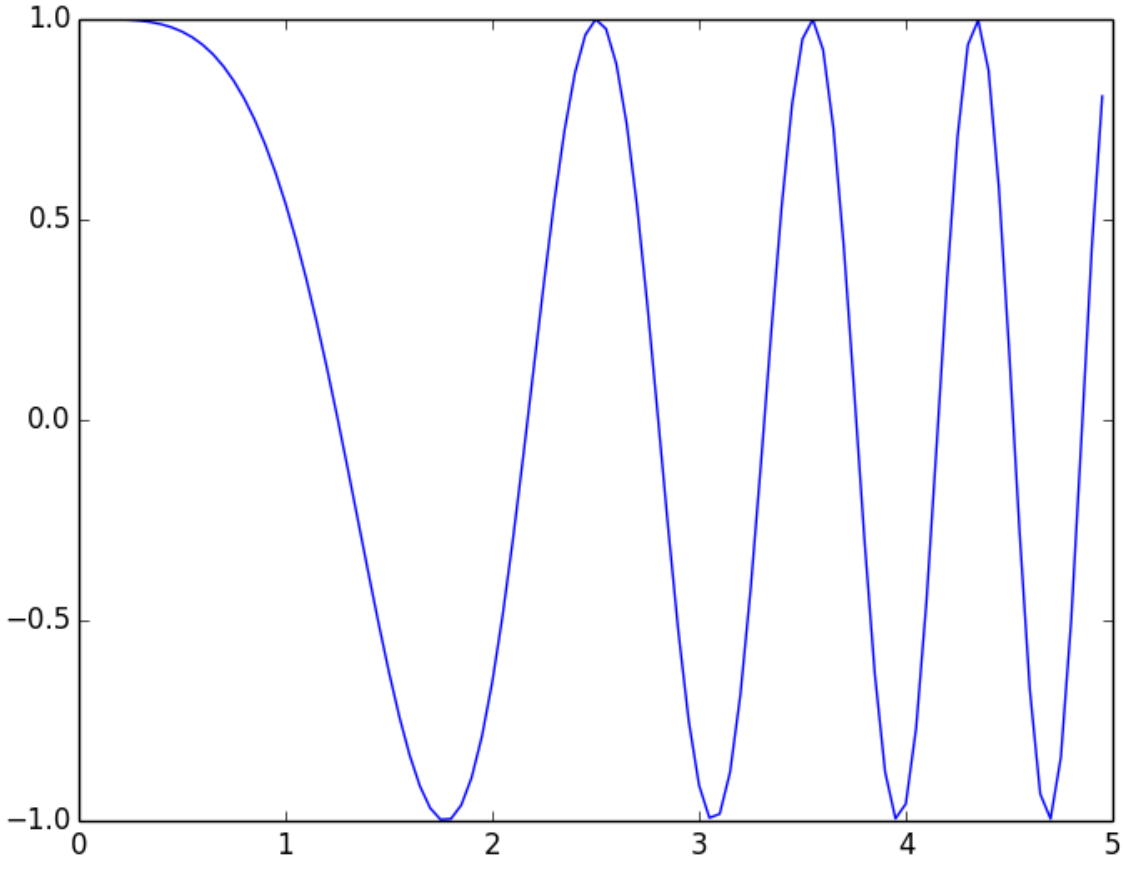
option 2



option 3



option 4



Question 11

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

```
# 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.