

▼ Sample Test 2 | Deep Learning, Spring 2019 | February 21, 2019 | Total Points = 60

All questions have equal points. This is a closed book exam. No electronics or cheat sheets are allowed.

Name: _____

Question 1

Following code loads the Pima Indian Diabetest Dataset into the "pima" variable. The shape of "pima" is also shown below. Write a line of numpy (Python) code to create a variable "pima_train_x" that will have the first 600 rows and first 8 columns of the data in "pima". Write another line of numpy (Python) to load the first 8 columns of the last 100 rows to "pima_valid_x".

```
1 url = "https://raw.githubusercontent.com/badriadhikari/2019-Spring-DL/"
2 url = url + "master/course-content/Module1-Intro2ML/pima-indians-diabetes.csv"
3 pima = np.loadtxt(url, delimiter=",")
4 print(pima.shape)
```

↳ (768, 9)

Question2

When is the metric "accuracy" (# of correct-predictions divided by the total) not reliable? Discuss with concrete example/s.

Question 3

Suppose that we want to add a constant vector (variable "v" below) to each row of a matrix (variable "x" below). Complete the Python numpy code below to add v to x.

```
1 x = np.array([[1,2,3], [4,5,6], [7,8,9], [10, 11, 12]])
2 v = np.array([1, 0, 1])
3 print(x)
4 print(v)
5
6
7
8
```

↳ $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \\ 10 & 11 & 12 \\ 1 & 0 & 1 \end{bmatrix}$

Question 4

Of the two print statements below, one of them will throw an error. What will be the output of the print statement that does not throw the error.

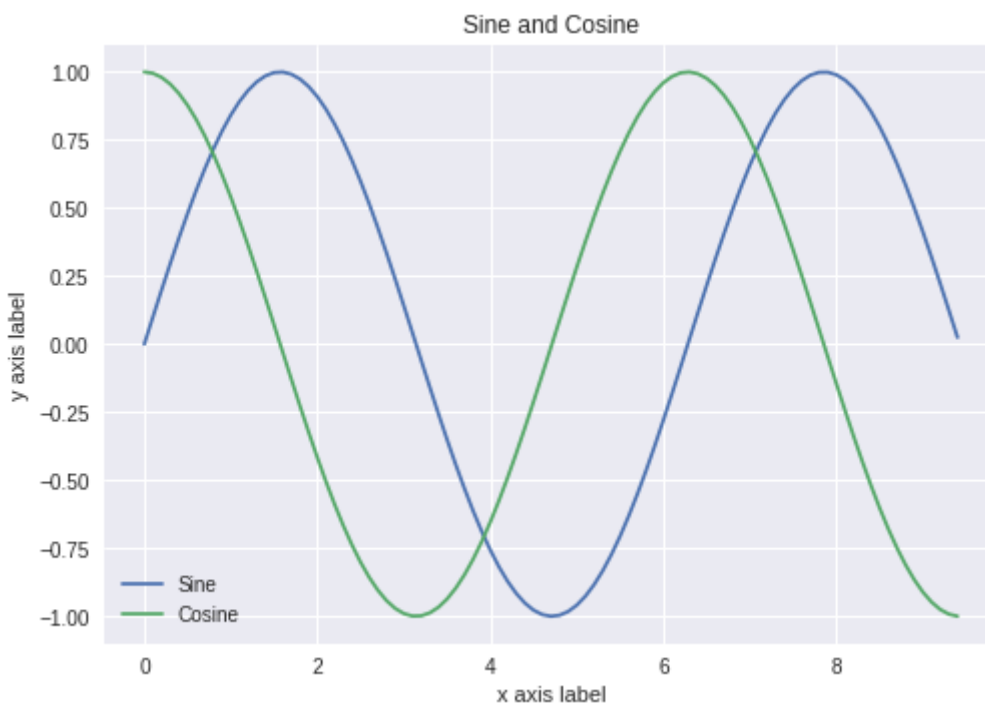
```
1 x = np.array([[1,2,3], [4,5,6]])
2 v = np.array([1,2,3]).
3 w = np.array([4,5])
```

```
4 print(x + v)
5 print(x + w)
```

Question 5

Complete the code below to obtain the output shown.

```
1 import matplotlib.pyplot as plt
2 x = np.arange(0, 3 * np.pi, 0.1)
3 y = np.sin(x)
4 z = np.cos(x)
5
6 plt._____
7 plt._____
8
9 plt.xlabel('x axis label')
10 plt.ylabel('y axis label')
11 plt.title('Sine and Cosine')
12 plt.legend(['Sine', 'Cosine'])
13 plt.show()
```



Question 6

Suggest any appropriate activation functions for the following types of problems:

1. Regression problem
2. Binary classification problem

Question 7

Complete the code below to display key/value pairs, one-by-one, in a Python dictionary. Hint: Use a for loop.

```
1 d = {'person': 2, 'cat': 4, 'spider': 8}
2
3
4
5
```

6

```

person 2
cat 4
spider 8

```

Question 8

Draw a diagram showing the connections between the neurons in the following artificial neural network.

```

1 from keras.models import Sequential
2 model = Sequential()
3 model.add(Dense(4, input_dim=3, activation='sigmoid'))
4 model.add(Dense(3, activation='sigmoid'))
5 model.add(Dense(1, activation='sigmoid'))

```

Question 9

a) What will the output plot of the following code look like? Draw the plot **with appropriate axis range values**.

b) Of the three curves, one is ReLU activation, one is sigmoid, and one is linear function. Label the three curves in your plot correctly identifying which is which function.

```

1 import numpy
2 import matplotlib.pyplot as plt
3
4 # gives numbers between -3 and 3 at steps of 0.1
5 x = numpy.arange(-3, 3, 0.1)
6
7 activation1 = 1 / (1 + numpy.exp(-x))
8 plt.plot(x, activation1)
9
10 activation2 = numpy.maximum(x, 0)
11 plt.plot(x, activation2)
12
13 activation3 = x
14 plt.plot(x, activation3)
15
16 plt.show()

```

Question 10

In the context of a binary classification problem, below are two vectors - one with correct output labels (Y) and another one with confidences (probabilities) predicted by a neural network. Calculate the (a) accuracy, (b) precision, and (c) recall for the model.

```

1 True Labels:
2 [1.00 0.00 1.00 0.00 1.00 0.00 1.00 0.00 1.00 1.00]
3
4 Predictions:
5 [0.70 0.17 0.70 0.13 0.62 0.23 0.18 0.35 0.62 0.38]

```