**LAFDS Session 1 Homework**

**Full Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Group No.: \_\_\_\_**

**Lecturer Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Submission date: \_/\_/\_\_ Grade: \_\_/30**

## Please write down all the steps not the final answer only

## Questions (21 points):

1. (1 point) The angle between the vectors (1, 0, −1, 3) and (1, , 3, −3) in is aπ, where a = \_\_\_\_.
2. (1 point) Which of the angles (if any) of triangle ABC, with A = (1, −2, 0), B = (2, 1, −2), and C = (6, −1, −3), is a right angle? Answer: the angle at vertex \_\_\_\_\_\_.
3. (7 points) Practice with numbers (if there is no answer, say so)
4. (3 points) If one side of the triangle increases by 11 cm and the other side decreases by the same value, we get an equilateral triangle. When the first side is multiplied by four, it is 10 cm longer than three times the third side. Find the lengths of the triangle's sides. Write this in a matrix-vector form
5. (4 points) Two containers contain a water of different temperatures. If we mix 240 g of water from the first container with 260 g of water from the second container, the resulting water temperature will be 52°C. If we mix 180 g of water from the first container with 120 g of water from the second container, the resulting water temperature will be 46°C. What is the temperature of water in the containers?. Write this in a matrix-vector form.
6. (5 points) If one dimension of the cuboid increases by 1 cm, the surface area of the cuboid increases by 54 cm2. If the second dimension of the cuboid increases by 2 cm, the surface area of the cuboid increases by 96 cm2. If the third dimension of the cuboid increases by 3 cm, its surface area increases by 126 cm2. Find the dimensions of the cuboid. Write this in a matrix-vector form

## Practice with Code (9 points):

1. (1 point) Write a NumPy code line(s) to get and print your numpy library version
2. (1 point) Write a NumPy code line(s) to get help on the “add” function.
3. (1 point) Write a NumPy code line(s) to test whether any of the elements of an input array is non-zero
4. (2 points) Write a NumPy code line(s) to compute the x and y coordinates for points on a sine curve and plot the points using matplotlib.
5. (2 points) Write a NumPy code line(s) to add elements in a matrix. If an element in the matrix is 0, we will not add the element below this element (in red)
6. (1 point) Write a NumPy code line(s) to extract all numbers which are less and greater than a specified integer in an input array
7. (1 point) Write a NumPy code line(s) to find the missing (hint: undefined) data in an input array

## Reading homework:

* + Numpy vs. Scipy: <https://bit.ly/3vURVkl>
  + Numpy documentation: <https://numpy.org/doc/stable/user/quickstart.html>
  + "Python for Data Analysis by Wes McKinney" Chapter 4: <https://www.oreilly.com/library/view/python-for-data/9781449323592/ch04.html>
  + Scalars and vectors: <https://www.mathsisfun.com/algebra/scalar-vector-matrix.html>
  + Vectors and matrices: <https://www.statlect.com/matrix-algebra/vectors-and-matrices>
  + Dot product: <https://www.mathsisfun.com/algebra/vectors-dot-product.html>
  + Operations on matrices: <https://medium.com/linear-algebra/part-2-operations-on-matrices-3caab542aebd>