

Student name: **Enter your name here**

## Homework Assignment 1

To be uploaded to <http://bCourses.berkeley.edu> as DOCX file.

### (1) Basic variable assignments (2pts):

Enter the following commands

```
>> a=10
>> b=a*a*a
>> a=5
>> b
```

What is the value of  $b$  at the end, 5 or 1000? Explain how Matlab handles assignments!

### (2) Vectors as lists of numbers (5pts):

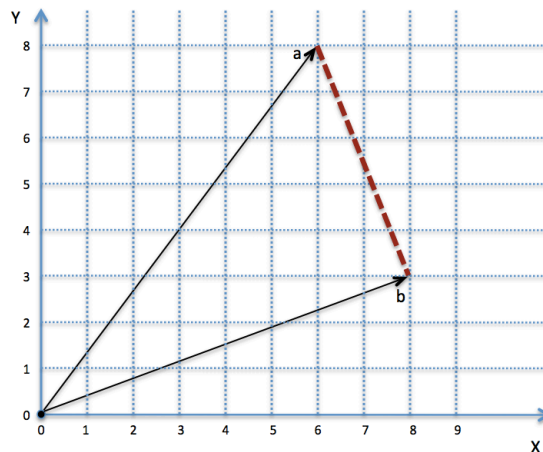
Write down the Matlab command that generate a column vector with two elements. Set the first one to 2 and second one to 5.

Write down the Matlab commands that assign a row vector with 5 elements: the numbers 2,3,4,5, and 6.

Write down the Matlab commands that assign a vector with 10 elements: the numbers 4, 7, 10, and so on.

Enter the Matlab command that generate a vector with 100 elements. Then set the first 50 elements set to 1 and the others set to -1.

### (3) Vectors in 2D (8pts):



Vectors are essentially lists of numbers but they can also have a geometric meaning if one assigns the first number to  $x$  and the second number to the  $y$  coordinate. Please submit the 5 to 7 lines of Matlab code that do the following: Assign the  $(x=6,y=8)$  vector to the variables  $a$ . Print the length of this vector using the `norm()` function. Assign vector

$b$  according to the diagram above and then compute the distance between points  $a$  and  $b$  with only one line of code. Enter all those Matlab commands here:

Imaging vector  $a$  represents the location of a car moving from (0,8), (1,8), (2,8), (3,8), (4,8), (5,8), (6,8), (7,8), (8,8), (9,8), (10,8), (11,8), (12,8), (13,8), (14,8), (15,8). Please submit a table where, for every point, you print the x coordinate of the car and its distance from point  $b$ . (As always in this course, you may use any Matlab command you like.)

#### (4) Which sin function in Matlab is the right one? (1pt)

Please compare the following two *sin* functions. What is the difference? Use the Matlab help function to figure it out.

```
>> sin(90)
>> sind(90)
```

#### (5) 2D plotting (5pts):

Make a XY plot for the functions

$$f(x) = 3 \cos(x)$$

$$f(x) = 2 \cos(2x)$$

$$f(x) = \cos(3x)$$

The  $x$  values should be in degrees (not radians) and vary between 0 and 360. Please use different lines styles for each function and label your axes. Enter your graph as PNG file here:

#### (6) More 2D plotting (8pts):

Make one 2D plot for  $0 \leq x \leq 1$  containing the following 6 functions

$$f(x) = x$$

$$g(x) = r x (1-x)$$

with  $r = \{0.5, 1.5, 2.5, 3.5, \text{ and } 4\}$ . Label the axes, choose very different line styles for each curve, and add a legend for each curve. Please insert the resulting graph here. For what values of  $r$  do  $f(x)$  and  $g(x)$  intersect?

Produce and submit a second graph that shows the function  $h(x)$  versus  $x$  for all  $r$  values:

$$g(x) = r x (1-x)$$

$$h(x) = h(g(x)) = h(g) = r g (1-g)$$

#### (7) Surface area of a sphere (4pts):

The purpose of this part is to prepare you for the next computer lab where we want to compute the ocean volume. The surface area,  $A$ , of a sphere with radius  $R$  is given by

$$A = 4 \pi R^2$$

Re-derive this formula and write down the 3 essential steps. (Use MS Equation Editor or plain text.) This formula is usually derived from a double integral over the polar angle  $\phi$  and the azimuthal angle  $\theta$ . Find it on the internet or look it up elsewhere.