When you have completed the lab, show this sheet and any associated programs to your lab instructor, who will record that you have completed the lab. If you do not finish this exercise during the lab, show the instructor what you have done at the end of the lab and be sure to complete it in the next few days.

1 Vectors and subvectors

In lecture you learned about creating vectors and accessing individual cells of a vector. MATLAB allows us to access multiple cells of a vector, or subvectors.

Type the statements/expressions below in the command window and write down the resulting vectors on the blanks. Learn the syntax! If you do not understand why you obtain the displayed results, ask.

```matlab
% Build vectors by concatenation
x = [2 4];
x = [x 0] %____________________________________________
c = 'vowels: '; %Look at the workspace pane: c is of type char array.
c = [c 'aeiou'] %___________________________________________
str0 = 'Five vowels';
numVowels = 5;
str1 = ' vowels';
str2 = [numVowels str1] % Try it. This doesn’t give the string ’5 vowels’.
str2 = [num2str(numVowels) str1] %_________________________________________
% What does function num2str do? If you don’t know, type in the
% command window: help num2str

% Subvectors
x = [2 5 8 6 9]
x(1:3) %____________________________________
x(3:length(x)) %____________________________________
x(3:end) %____________________________________
x(:) %____________________________________
% What does the colon mean when used as an index? ________________
x([1,3,4]) %____________________________________
```

2 Distance between two DNA strands

The “distance” between two DNA strands is a measure of how different two strands are. Define the distance as the number of positions where the bases on the two strands do not match divided by the length of the strand. For example, the two strands

ACTGACTTAC
ACGCAGTTAG

are different at four positions (3, 4, 6, 10), giving the distance value 4/10 = 0.25. Count the difference in strand lengths as mismatches, e.g.,

ACTGACT
ACGG

give the distance value (1 + 3)/7. Assume that strand 1 is longer than or equal in length to strand 2. Implement the following function:
function dist= distance(s1, s2)
% Post: dist is the distance between DNA strands s1 and s2
% Pre: length(s1)>=length(s2)>0. Both strands contain upper case
%      letters or both strands contain lower case letter.

3 Vectorized code

A program fragment is vectorized if its statements perform arithmetic and boolean operations on multiple cells at the same time. For example,

    a= [1 3 6 1]
    b= [1 0 2 1]
    c= a + b  % Vectorized code: the addition is performed on all cells
    % of vectors a and b in one statement to give  c=[2 3 8 1]
    
    d= c./2  % Vectorized code. Result is d=[1 1.5 4 0.5]
    % The dot (.) is required in front of the operators *, /, and ^
    % when the operation is vectorized.

Write a script to evaluate the function \( f(x) = x^2 - 5x \) for \( x = 1, 3, 5, \ldots, 15 \), and make a plot of the function values. Give the plot a title and label the x- and y-axes. Use vectorized code—do not use loops.

4 Learn from Prelim 1

Do you understand your mistakes (if any) in Prelim 1? Now or in the next few days, figure out how to do the questions you got wrong. For small errors, you can figure them out independently or check the posted solutions, but for serious mistakes, re-do the question from scratch without looking at the solution! You won’t learn much from just reading the solution. Instead, attempt the question again and if necessary, ask a CS100M staff member to lead you through the process of writing a correct solution—you will learn much more this way.