CSC 336F ASSIGNMENT #4 Due: 5 December 2018.

This assignment is due at the start of the lecture on Wednesday, 5 December 2018. (The "late date" for this assignment, as defined in the course outline, is Thursday, 6 December 2018, the last CSC 336 lecture of the term. This is the so-called *Make-up Monday*.)

For the questions that require you to write a MatLab program, hand-in the program and its output as well as any written answers requested in the question. Your program and its output, as well as your written answers, will be marked. Your program should conform to the usual CS standards for comments, good programming style, etc. When first learning to program in MatLab, students often produce long, messy output, but you should be an experienced MatLab programmer now. So, try to format the output from your programs so that it is easy for your TA to read and to understand your results.

1. [10 marks: 5 marks each for parts (a) and (b)]

   Consider the equation
   $$f(x) = x^2 - 2$$
   The roots of $f(x)$ are obviously $\pm\sqrt{2}$.

   (a) Write a MatLab program that starts with the initial guess $x_0 = 1$ and uses Newton's method to compute the positive root of $f(x)$. Your program should print a table of values with the header

n	x_n	$x_n - \sqrt{2}$

   You may not be able to do subscripts properly in MatLab; if so, you can use $x(n)$ instead of x_n. Similarly for $\sqrt{2}$. Also, add additional spaces between the n, x_n and $x_n - \sqrt{2}$ as necessary to make the table "look nice".

   Your program should then print six lines, one line for each of $n = 0, 1, 2, \ldots, 5$. Each line should contain the values for n, x_n and $x_n - \sqrt{2}$ for the n associated with that line. Print n as an ineger and both x_n and $x_n - \sqrt{2}$ in the fprintf 20.15f format (or the equivalent if you use another output function).

   (b) Write a MatLab program that starts with the initial guesses $x_0 = 1$ and $x_1 = 2$ and uses the secant method to compute the positive root of $f(x)$. Your program should print a table of values with the header

n	x_n	$x_n - \sqrt{2}$

   You may not be able to do subscripts properly in MatLab; if so, you can use $x(n)$ instead of x_n. Similarly for $\sqrt{2}$. Also, add additional spaces between the n, x_n and $x_n - \sqrt{2}$ as necessary to make the table "look nice".

   Your program should then print eight lines, one line for each of $n = 0, 1, 2, \ldots, 7$. Each line should contain the values for n, x_n and $x_n - \sqrt{2}$ for the n associated with that line. Print n as an ineger and both x_n and $x_n - \sqrt{2}$ in the fprintf 20.15f format (or the equivalent if you use another output function).

2. [10 marks: 5 marks each for parts (a) and (b)]

   Do question 5.2 on page 250 of the course textbook.
   (You can find a copy of pages 250 and 251 of the course textbook on the course webpage
   `http://www.cs.toronto.edu/~krj/courses/336/`)

3. [10 marks]

   Do question 5.14 on page 251 of the course textbook.
   (You can find a copy of pages 250 and 251 of the course textbook on the course webpage
   `http://www.cs.toronto.edu/~krj/courses/336/`)

   The "zero finder" that you should use for this question is the MatLab function fzero. In
   particular, use the version of fzero described under "Root Starting From an Interval" on
   the webpage `http://www.mathworks.com/help/matlab/ref/fzero.html`. You may
   also find reading "help fzero" in MatLab helpful.

4. [12 marks]

   Do question 6 on last year's final exam. (You can find last year's final exam on the
   course webpage `http://www.cs.toronto.edu/~krj/courses/336/`).