Homework 2 – Math 407

1. Section 2.1: Exercises 2(a,b), 3, 5, 6

2. Section 2.2: Exercises 2(a,b), 4(a)

3. For each MATLAB program below, determine the number of operations it performs. Express your answers in terms of n.

   (a)
   ```
   v = zeros(n,1);
   for i=1:n
       for j=1:i
           v(j) = 1 + v(i) + v(j);
       end
       if i>1
           v(i) = 2*v(1);
       end
   end
   ```

   (b)
   ```
   v = ones(n,1);
   for i=1:n
       for j=1:n
           for k=j+1:n
               v(k) = 2*v(j);
           end
       end
   end
   ```

4. Consider a lower triangular linear system

$$\begin{aligned} a_{11}x_1 &= b_1, \\ a_{21}x_1 + a_{22}x_2 &= b_2, \\ a_{31}x_1 + a_{32}x_2 + a_{33}x_3 &= b_3, \\ &\vdots \\ a_{n1}x_1 + a_{n2}x_2 + a_{n3}x_3 + \ldots + a_{nn}x_n &= b_n. \end{aligned}$$

   (a) If $x_1, x_2, \ldots, x_{i-1}$ are known, what is x_i?

   (b) Write a MATLAB function that solves the above equations for $x_1, x_2, \ldots, x_n$, starting from x_1. The first line of your function should read

   ```
   function x = solvesystem(a,b)
   ```

   where `a` is an $n \times n$ array of coefficients (some of which are zero), `b` is an $n \times 1$ array, and `x` is an $n \times 1$ array.

   (c) Test your function on `a = [1 0 0 0; 2 3 0 0; 4 5 6 0; 7 8 9 10]` and `b = [2;1;3;-4]`. Report the vector `x` that you obtain.