ERCISES

1. Trace the operation of `Quicksort` on the list [23, 17, 21, 3, 42, 9, 13, 1, 2, 7, 35, 4]. Show the list order and the stack of (`first`, `last`, `pivot`) values at the start of every call. Count the number of comparisons and swaps that are done.

```
//Winograd's Method
matMultWinograd(A, B, C, m0, m1, m2)
        for(i = 1; i ≤ m0; i++)
                RF[i] = 0
                for(k = 1; k < m1; k += 2)
                        RF[i] = RF[i] + A[i][k] * A[i][k + 1]
        for(j = 1; j ≤ m2; j++)
                CF[j] = 0
                for(k = 1; k < m1; k += 2)
                        CF[j] = CF[j] + B[k][j] * B[k + 1][j]
        for(i = 1; i ≤ m0; i++)
                for(j = 1; j ≤ m2; j++)
                        C[i][j] = -RF[i] – CF[j]
                        for(k = 1; k < m1; k += 2)
                                C[i][j] = C[i][j] + (A[i][k] + B[k + 1][j]) *
                                        (A[i][k + 1] + B[k][j])
```

4. You are to use the algorithm for Winograd's Method given on Handout #5 to multiply the following two matrices:

$$\begin{bmatrix} 3 & 1 & -3 \\ 4 & 7 & 6 \end{bmatrix} \times \begin{bmatrix} 1 & 6 \\ 3 & -2 \\ 4 & -4 \end{bmatrix}$$

a. Give the contents of the the **CF** and **RF** arrays.

b. For each result element $\mathbf{C}_{ij}$ give the value of the cross products. Show your work.

c. Add the row factor, column factor, and the cross product term together to get the final value , and show the resulting **C** array.

d. How many additions did you perform, and how many multiplications did you perform.

e. How many *useless* additions and multiplications did you perform? (A useless operation is one in which one of the operands is 0.)

5. Show the steps in the Gauss-Jordan algorithm for the following system of linear equations:

$$3x_1 + 6x_2 + 2x_3 = 5$$
$$x_1 + 4x_2 + 2x_3 = 7$$
$$2x_1 + 5x_2 + 4x_3 = 9$$

COSC 428, 528
Fall 2017

Homework #4

Do the following exercises.

1. Do Exercise 1 on p. 119 of your text.

2. Give the factorization of the equation $x^7 + 4x^6 + 3x^5 - x^4 + 2x^3 + 5x - 9$ that results from Horner's method. Also show the result value for each pass of Horner's method using the input $x = 3$ with the given polynomial.

3. The following algorithm is a variation of the standard polynomial evaluation method. How many (a) additions and (b) multiplications are performed by the algorithm for a polynomial of degree n?

```
eval(x)
        pow = 1
        for(i = n; i ≥ 1; --i)
                pow = pow * x
        result = 0
        powsave = pow
        for(i = 0; i ≤ n; i++)
                result = result + a[i] * (powsave / pow)
                pow = pow / x
return(result)
```