COSC581 - Algorithms
Spring 2023
Homework #2

Due: Tuesday, 02/07/2023, before class.

1. Write the recurrence for the running time of recursive selection sort.

2. State True or False with justification/proof.
   a. If $A = \Omega(B)$, then $A = \omega(B)$.
   b. The worst case of merge sort is $O(n^2)$.

3. Prove that $f = O(g)$ and $f = \Omega(g) \Leftrightarrow f = \Theta(g)$.

4. For the following sets of functions, state whether f is O, o, Θ, $\sim$, Ω, and/or ω to g. State all that apply for each pair of functions. You do not need to show work.
   a. $f = n^2$, $g = 9n^2$
   b. $f = n^3 + 4$, $g = n^3 + 8n + \log(n)$
   c. $f = 2^n$, $g = n$
   d. $f = \log(2n)$, $g = n$
   e. $f = n\log(n)$, $g = n^n$

5. Show that $\log_2 n^{(\log_2 17)}$ is $\Theta(\log_2 17^{(\log_2 n)})$.

6. List the recurrence of Strassen's method and derive its time complexity using the master theorem.