CS 200 Algorithms and Data Structures
Written Assignment #2
Due on Feb, 15 at the beginning of the class

[Problem 1] 5 pts
Give as good big O estimations for:
   a) \( f(x) = 8n^3-9n^2 \)
   b) \( f(x) = \log_2n+20 \)
   c) \( f(x) = x^{4/2} \)
   d) \( f(x) = 2^x \)
   e) \( f(x) = \frac{(x^2+1)}{(x+1)} \)

[Problem 2] 5 pts
Show that \( (x^2+4x+17) \) is \( O(x^3) \).

[Problem 3] 8 pts (2+3+3)
Consider the following segment of the algorithm.

1: int \( t = 0; \)
2: for (int \( i = 0; i < n; i++ \}){
3:     for (int \( j = 0; j < n; j++ \}){
4:         if (i < j){
5:             \( t = t+i+j; \)
6:         }
7:     }
8: }

a) How many times does this algorithm perform comparisons (in line 4) with input \( n \) (positive integer)?
b) How many times does this algorithm perform additions (in line 5) for the input \( n \) (positive integer)?
c) Give a big-\( O \) estimate for the number of additions used in this segment of the algorithm

[Problem 4] 12 pts (3+3+3+3)
a) Trace the quicksort as it sorts the following array into ascending order (Assume that this algorithm chooses the first element as pivot.)
80, 40, 25 20,30,60,15
b) Trace the mergesort as it sorts the following array into ascending order
80, 40, 25, 20, 30, 60
c) Trace the bubble sort as it sorts the following array into descending order
10,12,23,34,5

d) Trace the insertion sort as it sorts the following array into ascending order
8,11,23,1,20,33