CPSC 5031 Algorithms
HW #1 (10 pts)

Exercises 2.2 #2 (2 points)

2. Use the informal definitions of O, Θ, and Ω to determine whether the following assertions are true or false.

a. $n(n+1)/2 \in O(n^3)$ **b.** $n(n+1)/2 \in O(n^2)$

c. $n(n+1)/2 \in \Theta(n^3)$ **d.** $n(n+1)/2 \in \Omega(n)$

Exercises 2.2 #6 (3 points)

6. a. Prove that every polynomial of degree k, $p(n) = a_k n^k + a_{k-1} n^{k-1} + \cdots + a_0$ with $a_k > 0$, belongs to $\Theta(n^k)$.

b. Prove that exponential functions a^n have different orders of growth for different values of base $a > 0$.

Exercises 2.3 #4 (5 points)

4. Consider the following algorithm.

ALGORITHM *Mystery*(n)

```
//Input: A nonnegative integer n
S ← 0
for i ← 1 to n do
    S ← S + i * i
return S
```

a. What does this algorithm compute?

b. What is its basic operation?

c. How many times is the basic operation executed?

d. What is the efficiency class of this algorithm?

e. Suggest an improvement, or a better algorithm altogether, and indicate its efficiency class. If you cannot do it, try to prove that, in fact, it cannot be done.

Note(s):

- All problems may be found in the Levitin textbook.

Submission:

- Deadline: Monday, 4/3/2023, 11:59pm
- Submit your solution as a PDF on Canvas under HW #1