Exercise:
Asymptotic Analysis

Exercise1

- Using informal definitions of O, Θ, Ω,
  - Determine: True or False??

a. $\frac{n(n+1)}{2} \in O(n^3)$

b. $\frac{n(n+1)}{2} \in O(n^2)$

c. $\frac{n(n+1)}{2} \in \Theta(n^3)$

d. $\frac{n(n+1)}{2} \in \Omega(n)$

Exercise2

- For each of the following functions, indicate the class $O(g(n))$ the function belongs to. (Use the simplest $g(n)$ possible in your answers.) Prove your assertions.

a. $(n^2 + 1)^{10}$

b. $\sqrt{10n^2 + 7n + 3}$

c. $2^{n+1} + 3^{n-1}$

d. $\lfloor \log n \rfloor$

Exercise3

Which value is larger?

1. n^2 vs n^3 (Hint: cancel same term)
2. 2^n vs n^2 (Hint: apply log and substitute n)
3. 3^n vs 2^n (Hint: apply log and cancel same term)
4. n^2 vs $n \log n$ (Hint: apply log and cancel same term)
5. n vs $(\log n)^{100}$ (Hint: apply log and substitute n. Use bigger n)

Exercise4

- List the following functions according to their order of growth from the lowest to the highest:
  - $(n-2)!$,
  - $5\lg(n+100)^{10}$,
  - 2^{2n},
  - $0.001n^4+3n^3+1$,
  - $\sqrt[3]{n}$,
  - 3^n.

Exercise:
Analysis of Iterative Algorithm

Example

```
A( )
{
    for (i = 1 to n){
        printf (“Salam”);
}}
```

```
A( )
{
    int i, j;
    for (i = 1 to n){
        for (j = 1 to n){
            printf (“Salam”);
}}}
```

```
A( )
{
    int i = 1, s = 1;
    while (s ≤ n){
        i++;
        s = s + i;
        printf ("Salam");
}}
```

Example

Exercise5

```
A( )
{
    for (i = 1; i^2 ≤ n; i + +){
        printf (“Salam”);
}
```

```
A( )
{
    int i, j, k, n;
     for (i = 1; i ≤ n; i + +){
         for (j = 1; j ≤ i;  j + +){
             for (k = 1; k ≤ 100; k + +){
                 printf (“Salam”);
    }}}
}
```