Latihan Soal Algoritma

1. Determine whether each of these functions is $O(x)$.

a) $f(x) = 10$
b) $f(x) = 3x + 7$
c) $f(x) = x^2 + x + 1$
d) $f(x) = 5 \log x$
e) $f(x) = \lfloor x \rfloor$
f) $f(x) = \lceil x/2 \rceil$

5. Show that $(x^2 + 1)/(x + 1)$ is $O(x)$.

7. Find the least integer n such that $f(x)$ is $O(x^n)$ for each of these functions.

a) $f(x) = 2x^3 + x^2 \log x$
b) $f(x) = 3x^3 + (\log x)^4$
c) $f(x) = (x^4 + x^2 + 1)/(x^3 + 1)$
d) $f(x) = (x^4 + 5 \log x)/(x^4 + 1)$

19. Determine whether each of the functions 2^{n+1} and 2^{2n} is $O(2^n)$.

23. Suppose that you have two different algorithms for solving a problem. To solve a problem of size n, the first algorithm uses exactly $n(\log n)$ operations and the second algorithm uses exactly $n^{3/2}$ operations. As n grows, which algorithm uses fewer operations?

25. Give as good a big-O estimate as possible for each of these functions.

a) $(n^2 + 8)(n + 1)$ **b)** $(n \log n + n^2)(n^3 + 2)$

c) $(n! + 2^n)(n^3 + \log(n^2 + 1))$

1. Give a big-O estimate for the number of operations (where an operation is an addition or a multiplication) used in this segment of an algorithm.

```
t := 0
for i := 1 to 3
  for j := 1 to 4
    t := t + ij
```

3. Give a big-O estimate for the number of operations, where an operation is a comparison or a multiplication, used in this segment of an algorithm (ignoring comparisons used to test the conditions in the **for** loops, where $a_1, a_2, \ldots, a_n$ are positive real numbers).

```
m := 0
for i := 1 to n
  for j := i + 1 to n
    m := max(a_i a_j, m)
```