

Exercises 3

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3.2

Set $f(x)$ is the most efficient expression.

$$f(x) = \begin{cases} \log_2 n = \log_3 n & n = 1 \\ n^{2/3} & n = 2 \\ 2 & n > 1 \end{cases}$$

3.3

$$2 < \log_3 n < \log_2 n < n^{2/3} < 20n < 4n^2 < 3^n < n!$$

3.16

For the original proposition, rewrite it as an anti-proposition: **There is a problem that for all algorithm, their upper bound are not equal to lower bound.** That means, the problem is **unstable** for any algorithm.

Is there such a problem?

In my knowledge, there should be a problem that involves **the subjective thinking of the person** and therefore it is **unstable**. Otherwise, it should be able to pass **the Turing test**.

So, the anti-proposition is true, the proposition is **false**.

3.18

```
int find(int K, int* a, int st, int ed){  
    if (a[st] > K) return -1; \\ -1 means ERROR
```

```
int l = st, r = ed;
for (int mid = (l + r) >> 1; l + 1 != r; mid = (l + r) >> 1){
    if (K < a[mid]) r = mid;
    if (K == a[mid]) return mid;
    if (K > a[mid]) l = mid;
}
if (l < st) return -1;
return l;
}
```