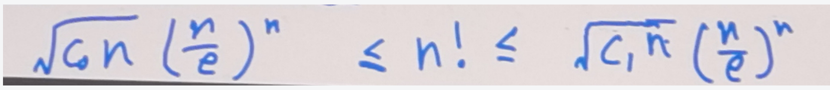
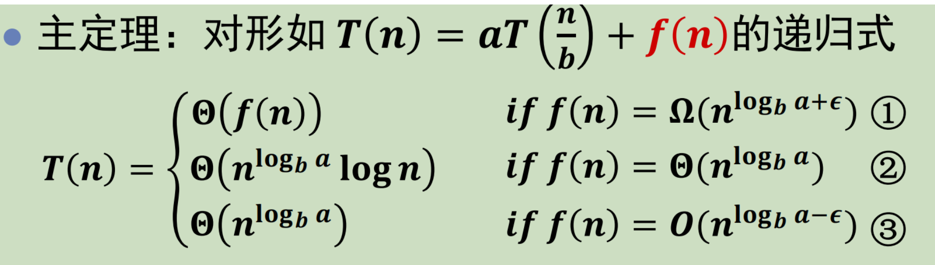
斯特勒公式



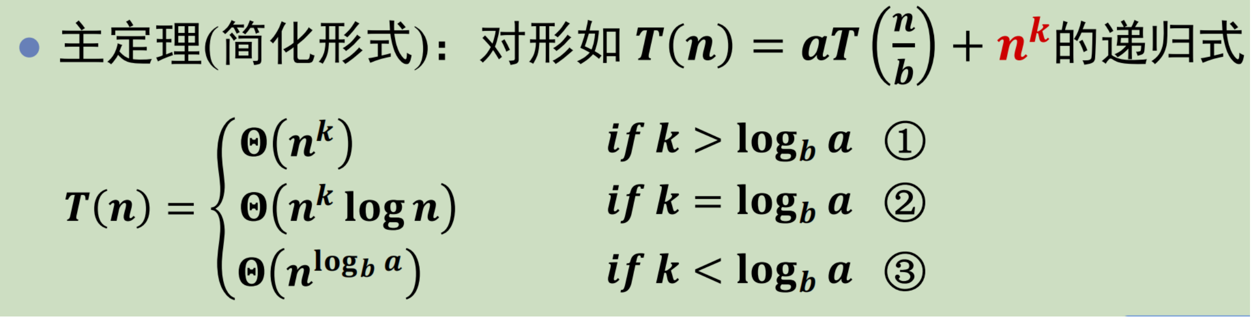
$$\sqrt{c_0 n}\left(\frac{n}{e}\right)^n \le n! \le \sqrt{c_1 n}\left(\frac{n}{e}\right)^n$$

主定理



- 主定理：对形如 $T(n) = aT\left(\frac{n}{b}\right) + f(n)$的递归式

$$T(n) = \begin{cases} \Theta(f(n)) & if\ f(n) = \Omega(n^{\log_b a+\epsilon}) \text{ ①} \\ \Theta(n^{\log_b a}\log n) & if\ f(n) = \Theta(n^{\log_b a}) \text{ ②} \\ \Theta(n^{\log_b a}) & if\ f(n) = O(n^{\log_b a-\epsilon}) \text{ ③} \end{cases}$$



- 主定理(简化形式)：对形如 $T(n) = aT\left(\frac{n}{b}\right) + n^k$的递归式

$$T(n) = \begin{cases} \Theta(n^k) & if\ k > \log_b a \text{ ①} \\ \Theta(n^k \log n) & if\ k = \log_b a \text{ ②} \\ \Theta(n^{\log_b a}) & if\ k < \log_b a \text{ ③} \end{cases}$$

算法代码

101归并排序

mergesort

```
Mergesort(A[1,n]):
if (n==1)
    sol=A
else
    left[1,n/2]=Mergesort(A[1,n/2])
    right[1,n/2]=Mergesort(A[n/2+1,n])
    sol[1,n]= Merge(left[1,n/2],right[1,n/2])
return sol[1,n]
```

merge

```
Merge(L[1,a],R[1,b]):
for (i = 1 to a )do
    for (j=1 to b)do
        while(L[i]<R[j])
            A.append(L[i])
            i+=1
        A.append(R[j])
TODO():一旦1个已赋值完，另一个直接加到末尾
```

102二分查找优化

```
Binarysearch(A,x):
left=1,right=n
while(left<=right)//而不是while true
    mid=(l+r)/2
    if(A[mid]==x)
        return mid
    else if(A[mid]<x)
        l=mid+1
    else
        r=mid-1
```

103partition+随机快排

104前中后序遍历

105BSF

```
BFS(G,u):
    for (each u in V)
        u.in=0
    FIFOQueue Q
    Q.enque(u)//入队是enque不是enqueue
    while (!Q.empty())
        u=Q.dequeue(),u.in=2
        for (each (u,v) in E)
            if(v.in==0)
                v.in=1
                Q.enque(v)
```

106DFS

迭代版

递归版

```
DFSALL(G,u):
    for(each u in V)
        u.visited=false
    DFS(G,u)
```

```
DFS(G,u):
    u.visited=true
    for(each (u,v) in E)
        if(v.visited==false)//这里要判断啊，不能直接调用
        DFS(G,v)
```

107MST--Prim

> Build a priority queue Q based on “dist” values
>
> 一句话已经都插入了

```
for(each u in E)
    u.d=INF u.in=0
```

```
pick an arbitrary node x
//no:Priority list Q,Q.push(x)
//yes:Build a priority queue Q based on “dist” values
//no:x.in=1
while(!Q.empty())
    u=Q.Extractmin()
    //yes:x.in=1，怎么能放循环外面呢
    for (each (u,v) in E)
        //no:if(v.in==0) v.d=w(u,v) Q.push(v)
        else if(v.d>w(u,v))
            v.d=w(u,v)
            Q.update(v,w(u,v))
```

108SSSP--Dijkstra

```
for(each u in V)
    u.d=INF
u.d=0
Build a priority queue Q based on “dist” values
while(!Q.empty())
    u=Q.Extractmin()
    for(each (u,v) in E)
        RELAX(u,v)
```

109最短路径Topological

```
for(each u in V)
    u.d=INF
s.d=0//初始化记得
Run DFS to obtain topological order
for(each u in topological order)
    for(each (u,v) in E)
        RELAX(u,v)
```

110SSSP--Bellman

数据结构代码

201反转链表

```
prev=L.head//先记录头指针
cur=prev.next
while(cur!=NULL)
    nxt=cur.next
    cur.next=prev//核心反转
    prev=cur
    cur=nxt;
L.head=prev//重置头指针
```

202堆重排+建堆+堆插入+堆取最大+堆排序

203BST：insert+successor+remove