Class 15

Tuesday, February 15, 2022 9:32 PM

$f(N) = f(f(N+11))$

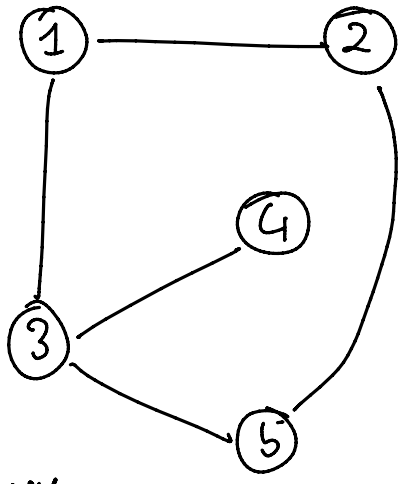
$f(N) = N-10$

```
int f(int n)
{ if(n>=101) return n-10;
  return f(f(n+11));
}
```

—o—

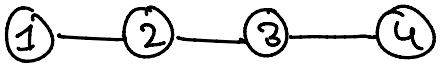
EDGE
- Directed
- Undirected

Graph Theory
- node/vertex
- edge



	1	2	3	4	5
1	1	1	1	0	0
2	1	1	0	0	1
3	1	0	1	1	1
4	0	0	1	1	0
5	0	1	1	0	1

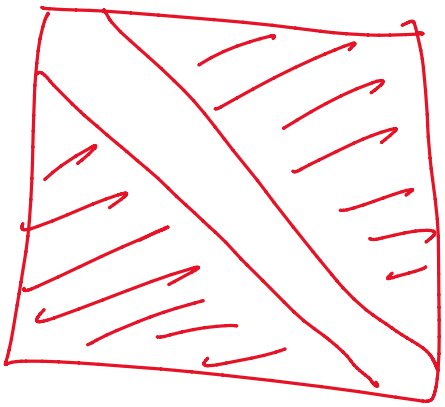
← Adjacency Matrix

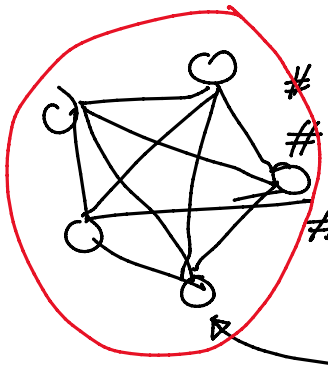


$O(N^2)$

N = # nodes

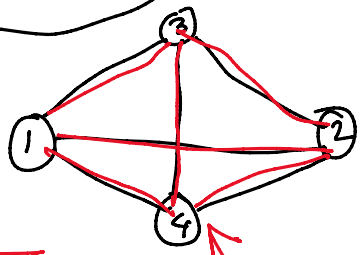
	1	2	3	4
1	1	1	0	0
2	1	1	1	0
3	0	1	1	1
4	0	0	1	1





Dense
Complete Graph

node: N
edge: $N C_2 \rightarrow \frac{N(N-1)}{2} \approx N^2$



1 2 →
1 3 →
1 4
2 3
2 4
3 4

$$^nC_2 = \frac{n!}{2!(n-2)!} = \frac{n \times (n-1) \times (n-2)!}{2 \times (n-2)!} = \frac{n(n-1)}{2}$$

$$^4C_2 = \frac{4!}{2!\,2!} = \frac{24}{2 \times 2} = \frac{24}{4} = 6$$

$$^NC_r = \frac{N!}{r!\,(N-r)!}$$

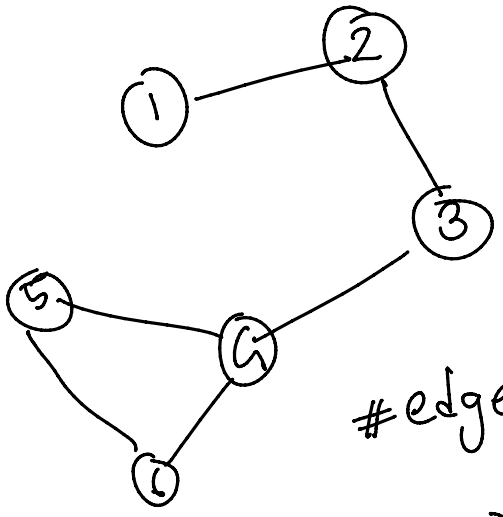
$$^5C_2 = \frac{5!}{2!\,3!} = \frac{5 \times 4 \times 3!}{2 \times 3!} = \frac{20}{2} = 10$$

o o o o o

— o —

node ≈ # edge

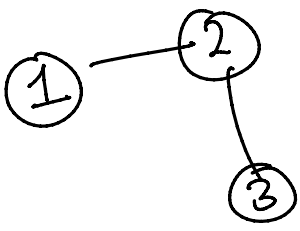
1 :	2
2 :	1, 3
3 :	2, 4
4 :	3, 5, 6
5 :	4, 6
6 :	4, 5



edge = 6

adj matrix → $O(N^2)$

adj list → $O(N + 2E)$

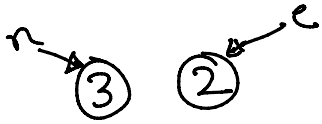


n = 3

e = 2

1 2

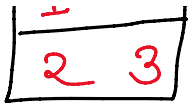
2 3



1	2
2	3

← Graph info

1 2
2 3



into