① $T(n) = 2T(n/2) + n^2 \log n$

Guess $T(n) = n \log n$

$\leq cn^2 \log n$

$\forall m < n$, guess is true

$m = n/2$

$T(n/2) \leq c \frac{n}{2} \log n/2$

$T(n) = 2T\left(\frac{n}{2}\right) + n^2 \log n$

$\leq 2\left[c \frac{n}{2} \log \frac{n}{2}\right] + n^2 \log n$

$\leq cn \log \frac{n}{2} + n^2 \log n$ dominates

$\leq n^2 \log n$ not

Our guess is correct.

Right Guess

$$T(n) \leq c n^2 \log n$$

$\forall m \leq n \quad m = n/2$

$$T\left(\frac{m}{2}\right) \leq c \frac{n^2}{4} \log \frac{n}{2}$$

$$T(n) = 2T\left(\frac{n}{2}\right) + n^2 \log n$$

$$\leq 2\left[\frac{n^2}{4} \log \frac{n}{2}\right] + n^2 \log n$$

$$\leq \frac{n^2}{2} \log \frac{n}{2} + n^2 \log n$$

$$\leq n^2 \log n = O(n^2 \log n)$$

Our guess is true

(2) $T(n) = T(n-1) + n^2$

Guess is $n \log n$

$T(n) = T(n-1)$

$T(n-1) \leq c(n-1)\log(n-1)$

$T(n) \not\leq T(n-1) + n^2$

$\leq c(n-1)\log(n+1) + n^2$

$\leq cn\log(n-1) - c\log(n+1) + n^2$

$\leq O(n^2)$

Our guess is not true.

Right Guess, $T(n) = O(n^3)$

$\forall m, \quad m = n-1$

$T(n-1) \leq c(n-1)^3$

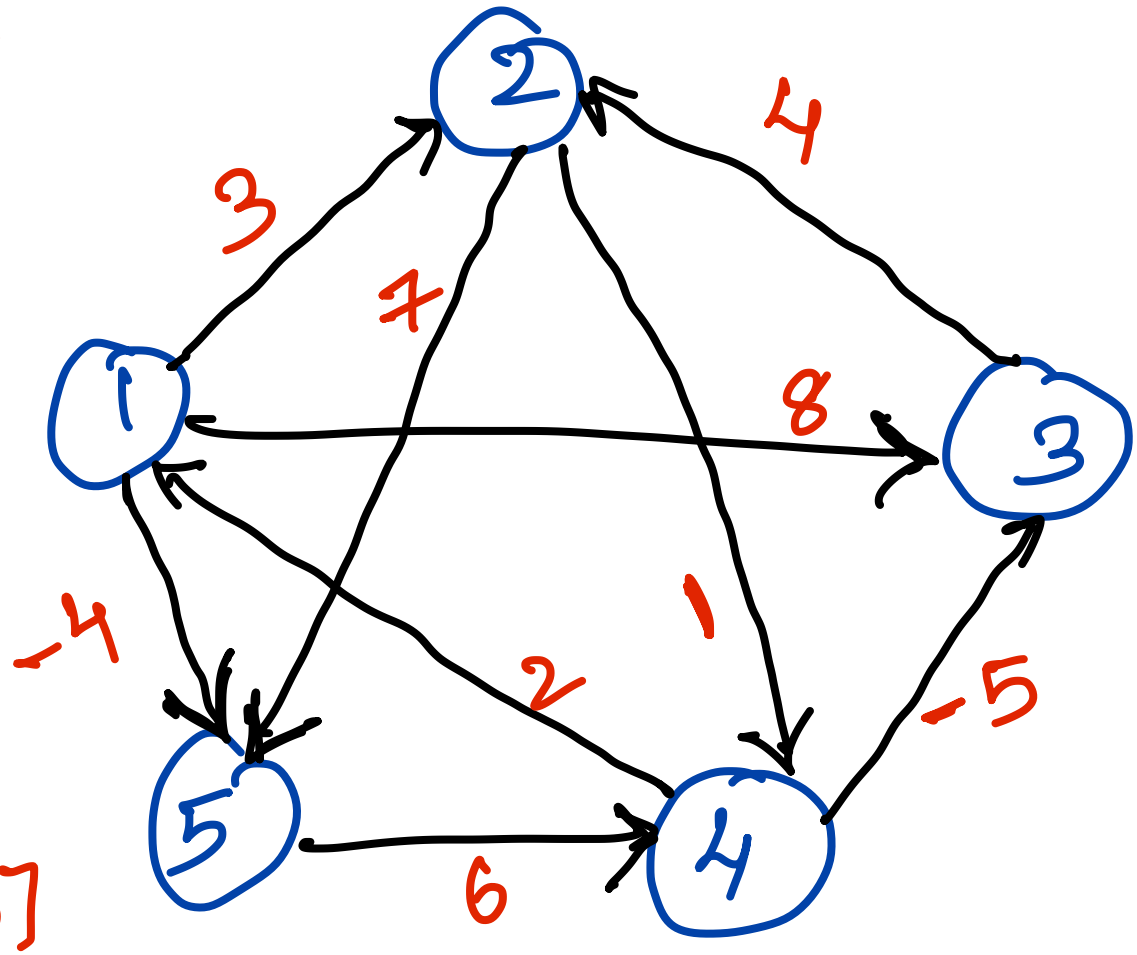
$T(n) = T(n-1) + n^2$

$\leq c(n-1)^3 + n^2$

$\leq c(n)^3 - 3n^2 + 3n - 1 + n^2$

$\leq cn^3$

③



D[0]

	1	2	3	4	5
1	0	3	8	∞	-4
2	∞	0	∞	1	7
3	∞	4	0	∞	∞
4	2	∞	-5	0	∞
5	∞	∞	∞	6	0

D[1]

	1	2	3	4	5
1	0	3	8	∞	-4
2	∞	0	∞	1	7
3	∞	4	0	∞	∞
4	2	5	-5	0	-2
5	∞	∞	∞	6	0

D[2]

	1	2	3	4	5
1	0	3	8	4	-4
2	∞	0	∞	1	7
3	∞	4	0	5	11
4	2	5	-5	0	-2
5	∞	∞	∞	6	0

D[3]

	1	2	3	4	5
1	0	3	8	4	-4
2	∞	0	∞	1	7
3	∞	4	0	5	11
4	2	-1	-5	0	-2
5	∞	∞	∞	6	0

D[4]

	1	2	3	4	5
1	0	3	-1	4	-4
2	3	0	-4	1	-1
3	-7	4	0	5	3
4	2	-1	-5	0	-2
5	8	5	1	6	0

	1	2	3	4	5
1	0	1	-3	2	-4
2	3	0	-4	1	-1
3	7	4	0	5	3
4	2	-1	-5	0	-2
5	8	5	1	6	0

Recursive Defn

$F[i, j, 0] = 0$ if $(i == j)$ and $C[i, j]$ otherwise

$$F[i, j, k] = \min \{ F[i, j, k-1], F[i, k, k-1] + F[k, j, k-1] \}$$