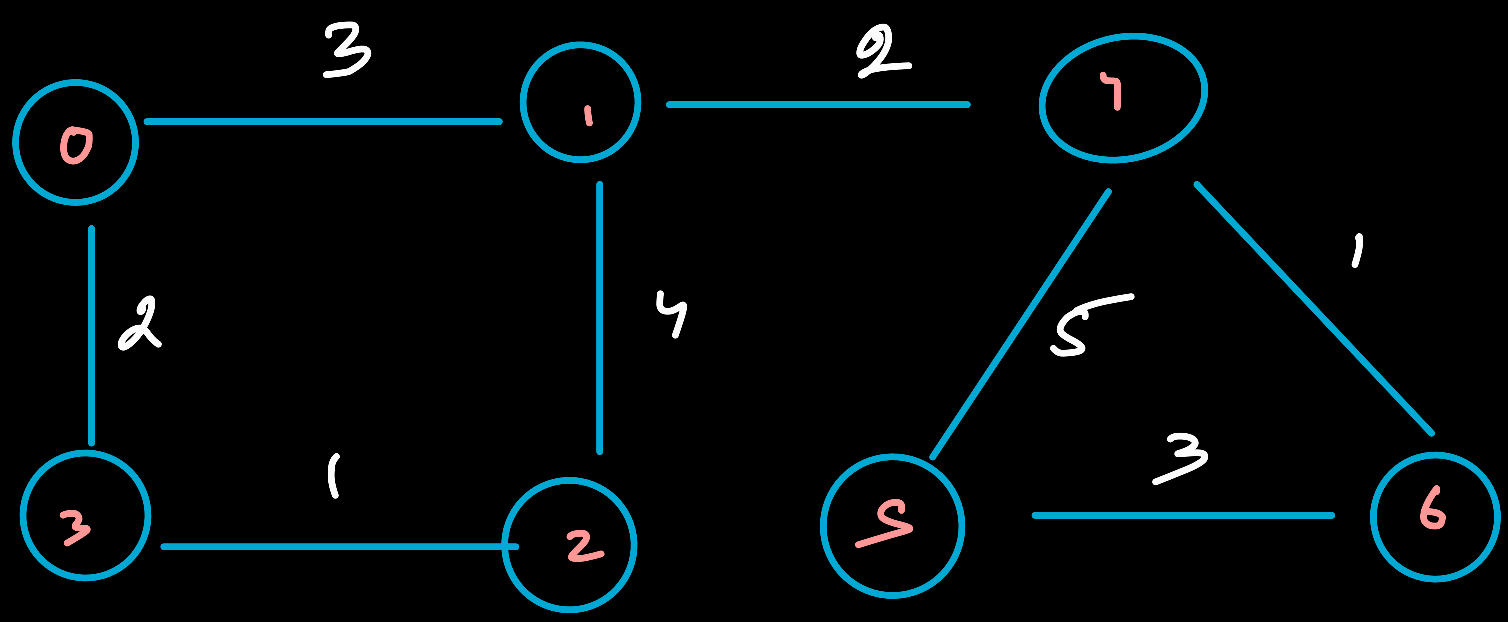


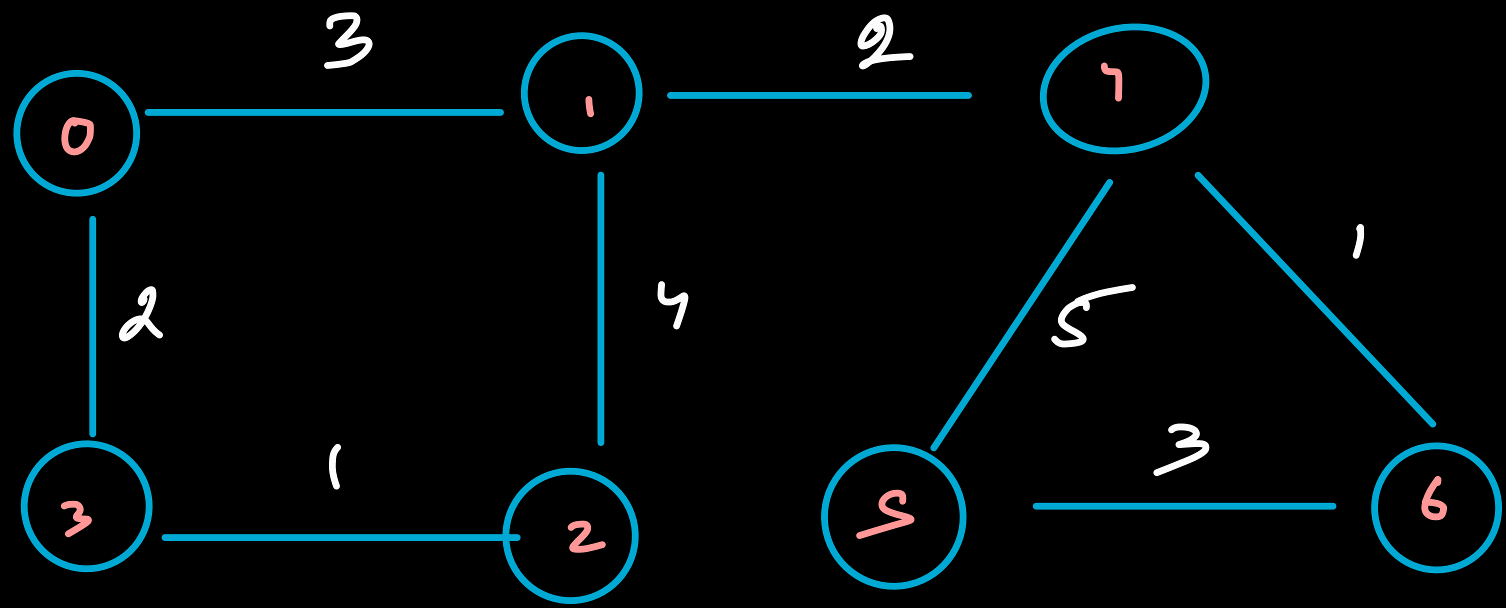
$G = [V, E]$ → undirected

↳ weighted

→ connected

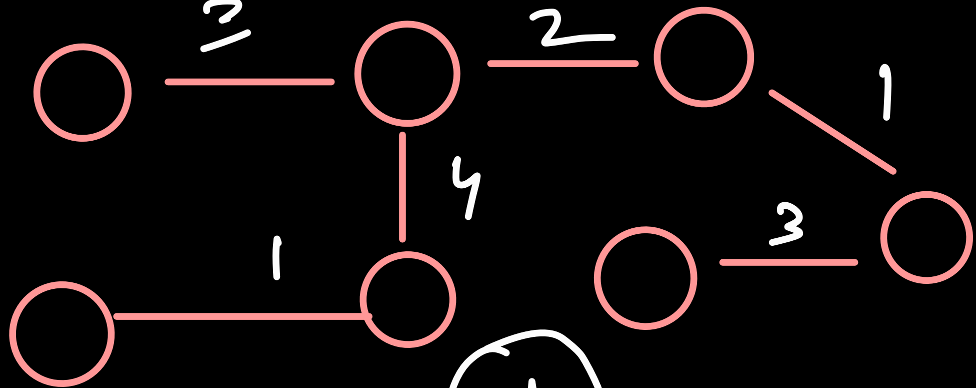
Special SubTree] → Tree → no cycles

↳ subgraph → it contains all the vertices



min sum

SG-1



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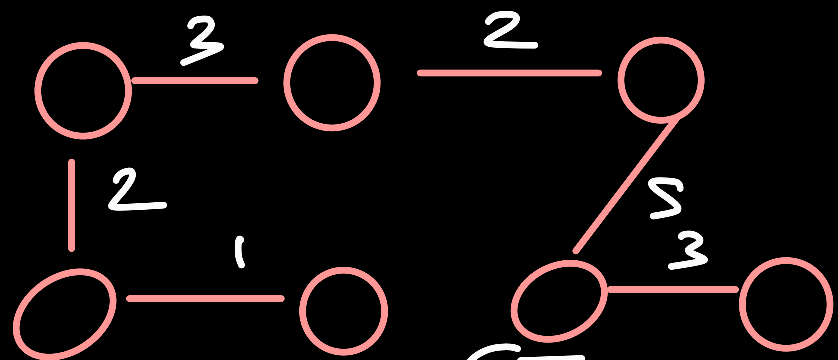
SG-2



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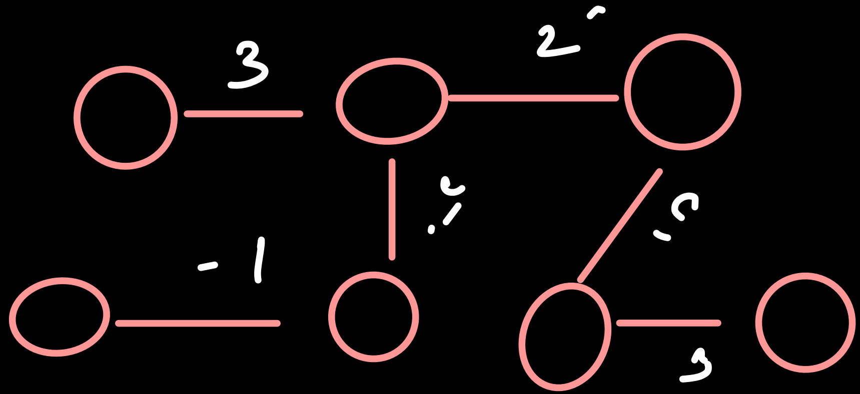
SG-3



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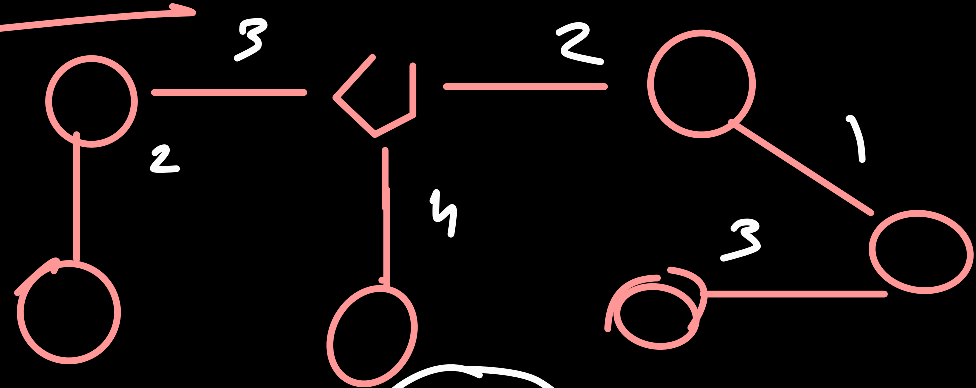
SG-4



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MST (minimum spanning tree)

tree → graph having no cycles

spanning → subgraph having all vertices but min no. of edges available to keep it connected

- Tree → no cycles
- includes all the nodes of graph
- → Sum of the edge wts is min

greedy

Algorithms to solve MST

Kruskals | Prims

↳ overall the only choice we need to make is on the
edges. Some edges will be picked Some won't.

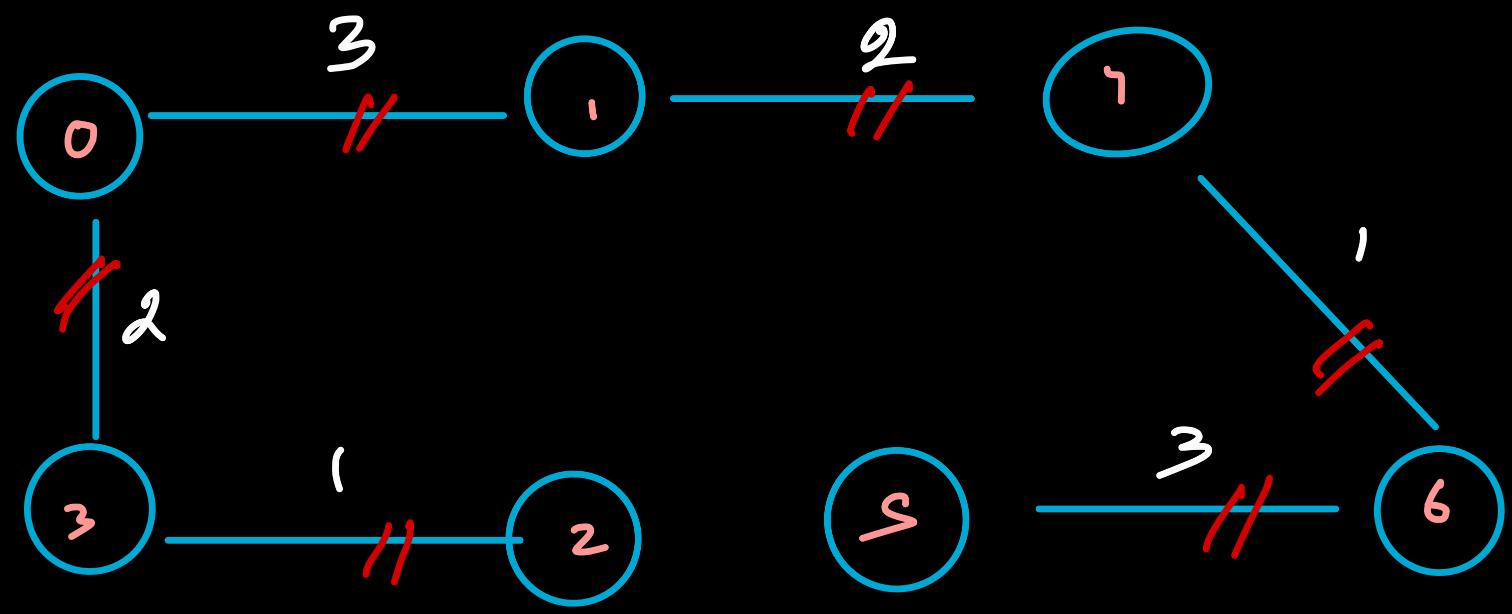
KRUSKAL'S

↳ One by one keep a picking edges with min weight.

↳ if choosing an edge forms a cycle avoid it, else use it.

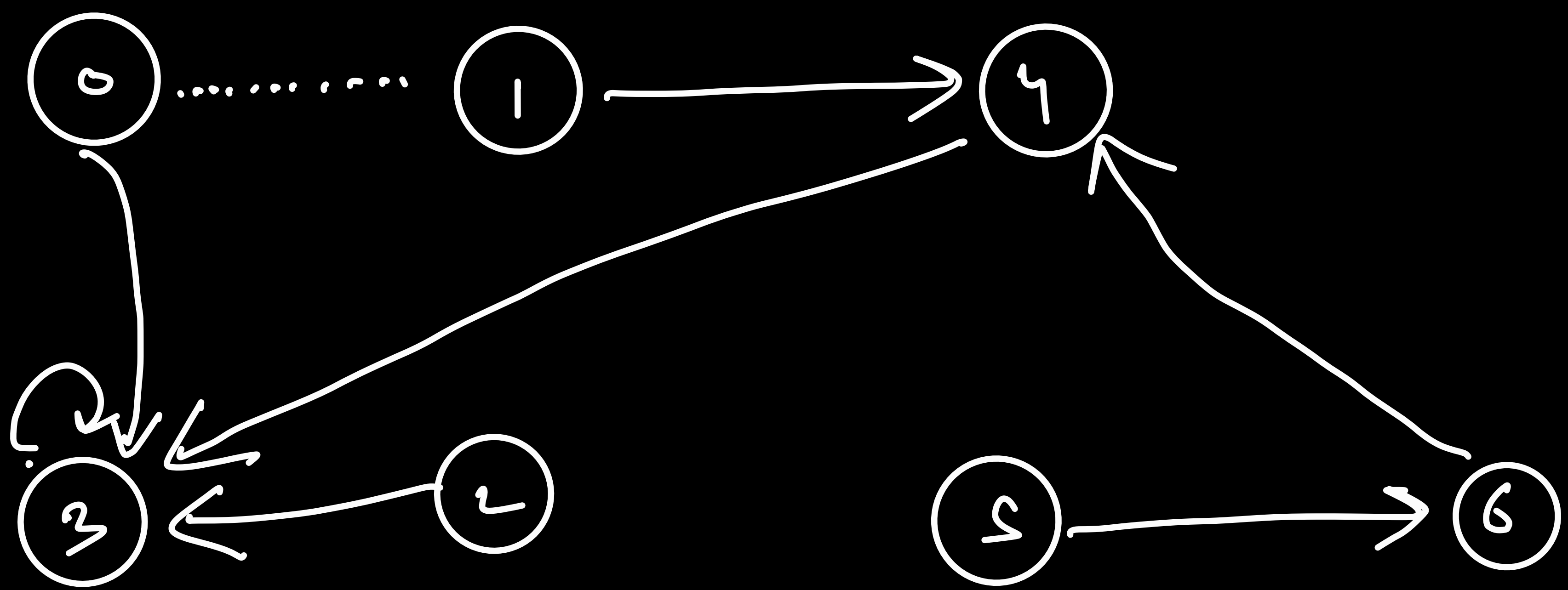
- → edge list → Sort by wt.
- → DSU

→ CORMEN

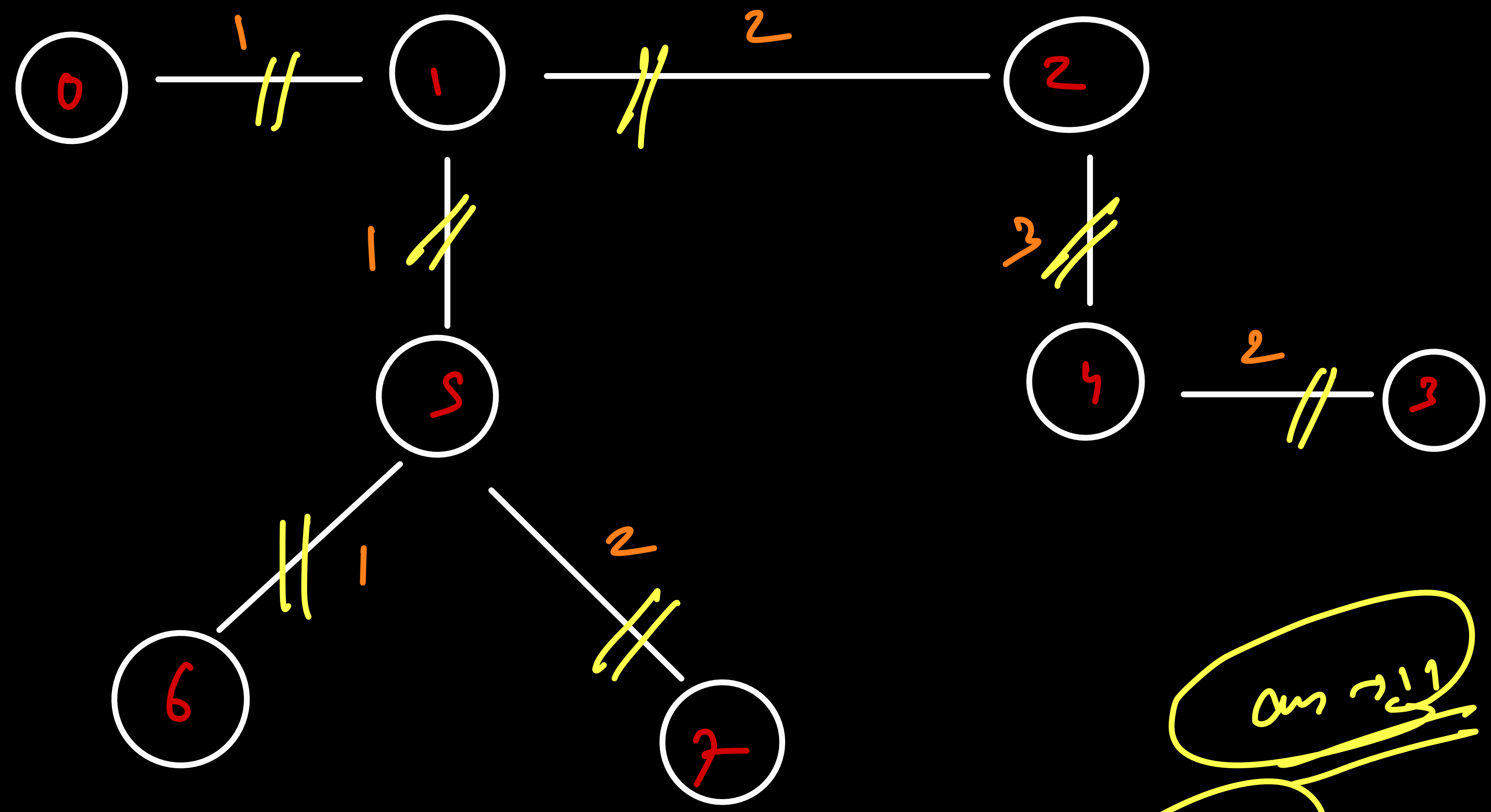


{ [3,2], [4,6], [0,3], [1,4],
[0,1], [5,6], [1,2], [4,5]
} → sort

12



ans = 0 + 1 + 1 +
2 + 2 + 3 + 3

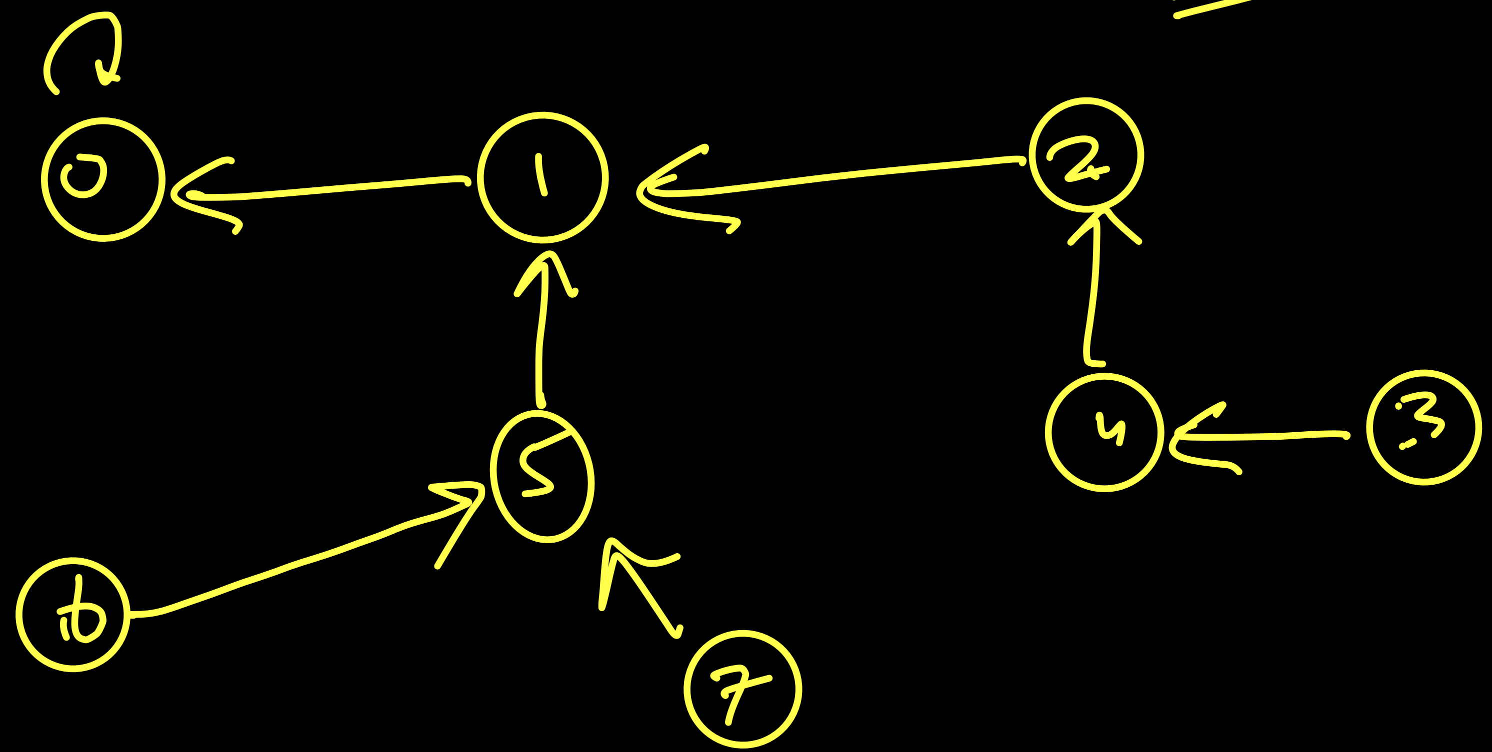


Sorted edge list

- ✓ (0, 1)
- ✓ (1, 5)
- ✓ (5, 6)
- ✓ (1, 2)
- ✓ (3, 4)
- ✓ (5, 7)
- ✗ (0, 6)
- → (2, 4)
- ✗ (6, 7)
- ✗ (2, 3)
- (5, 4) ✗
- (4, 7) ✗

1+1+1 + 2+2 + 2 + 3 → 12

ans → 11



↳ greedy choice → choosing smallest edge cut which donot form cycle.

↓

✓ $E_1 \to w_1$

$E_2 \to w_2$

↳ MST → x

$x + w_1 < x + w_2$

↓

$E_1 \to$ cycle

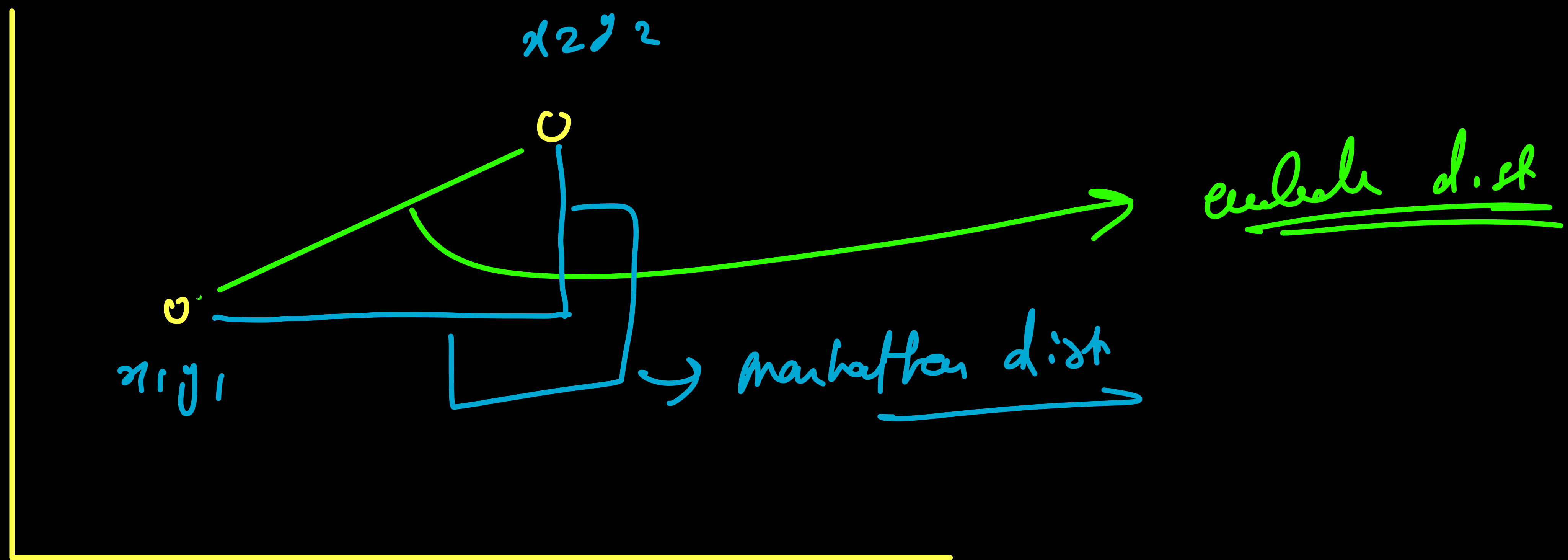
$x + w_1 < x + w_2$

✓ $E_1 \not\to$ cycle

$(x_1, y_1) \quad (x_2, y_2)$

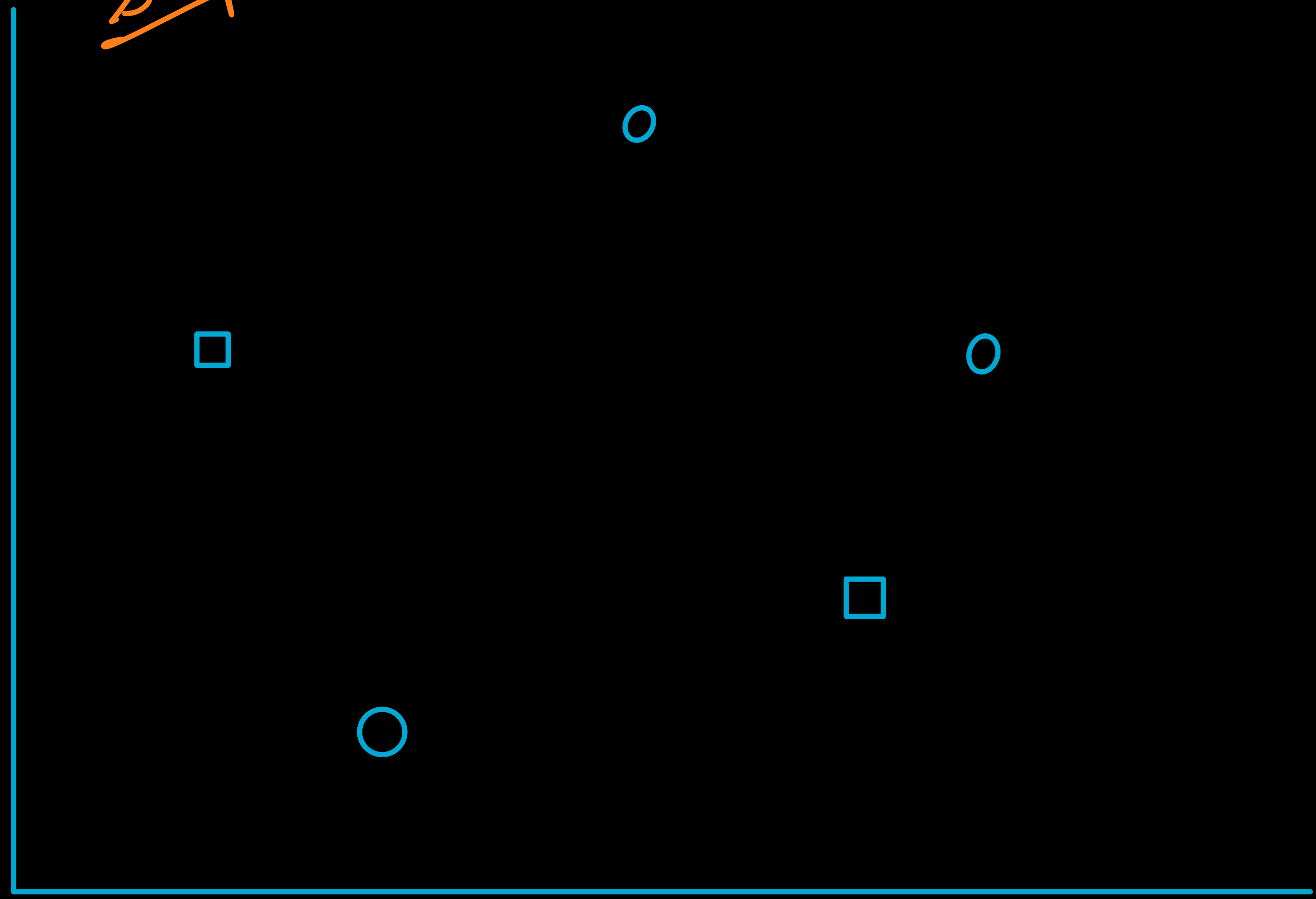
$$\left.\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}\right\} \rightarrow \text{euclidie dist}$$

Manhattan $\rightarrow$ $|x_2 - x_1| + |y_2 - y_1)$



Simple path $\rightarrow$ MST

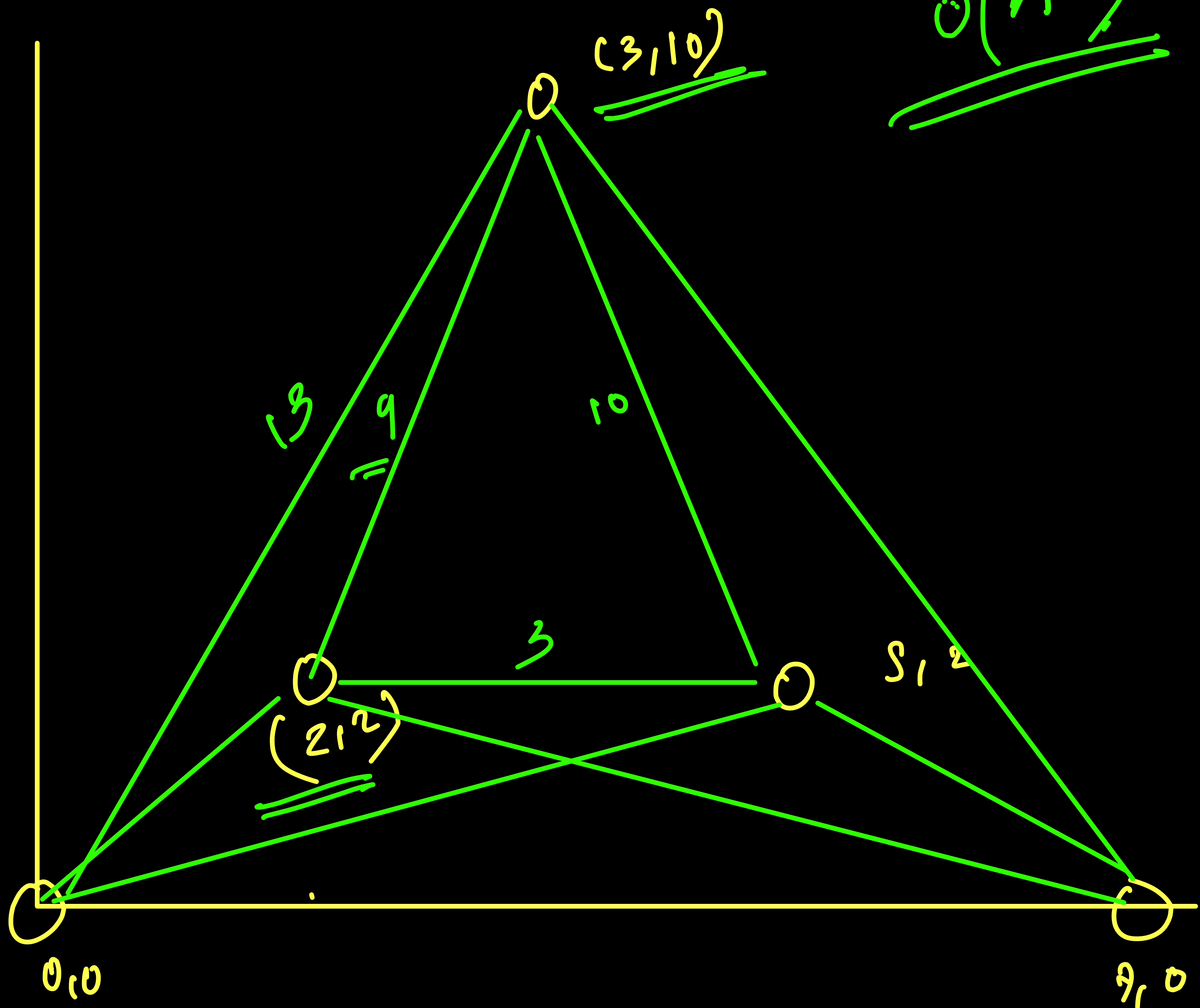
total $\rightarrow$ Σ edge cost



$|-3| \to 3$

$|3| \to 3$

$O(n^2)$



→ graph

→ MST Kruskal's

(3,10), (2,2)

↳ $|3-2| + |10-2|$

↓

$|1| + |8|$

→ $1+8 \to 9$