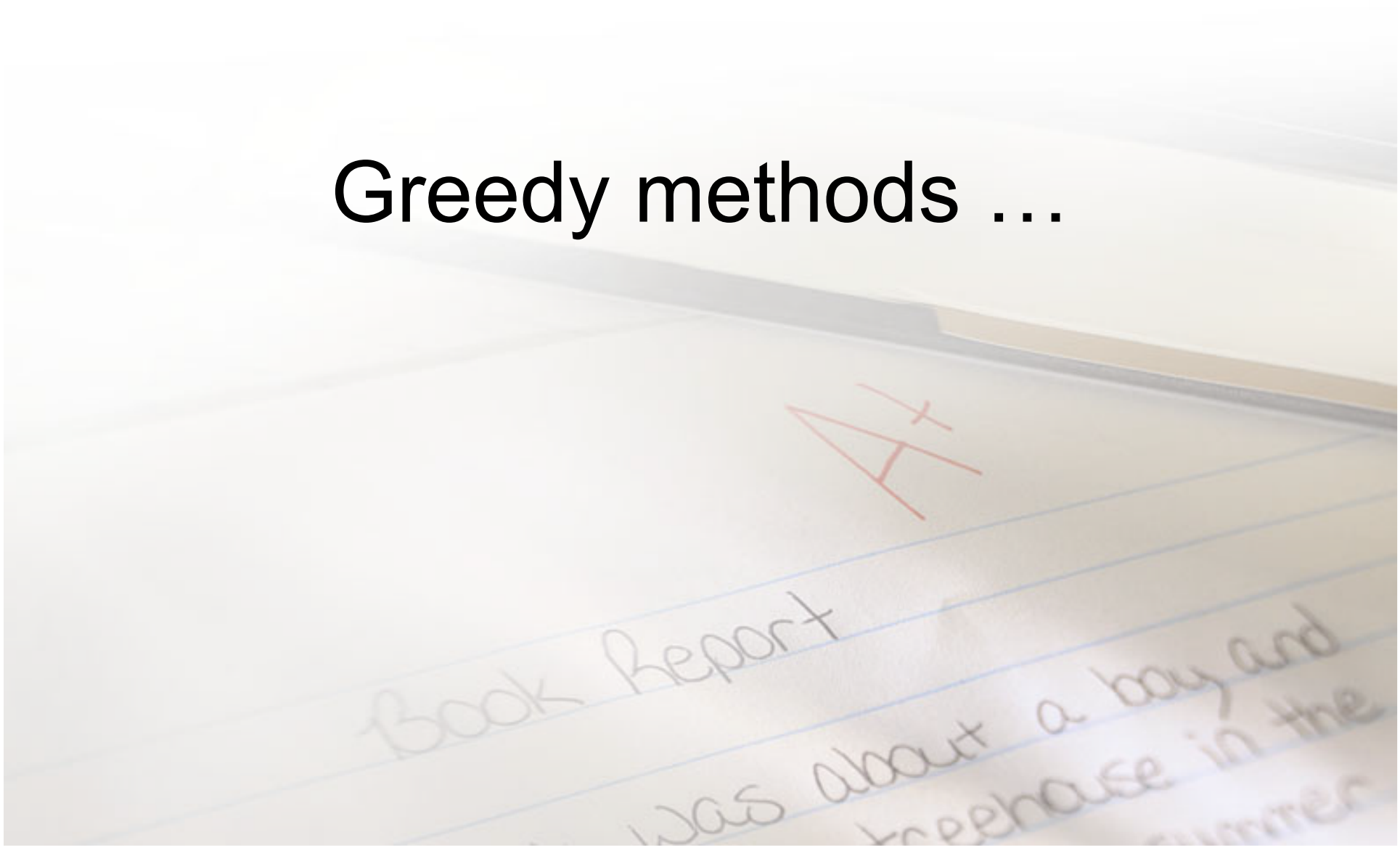
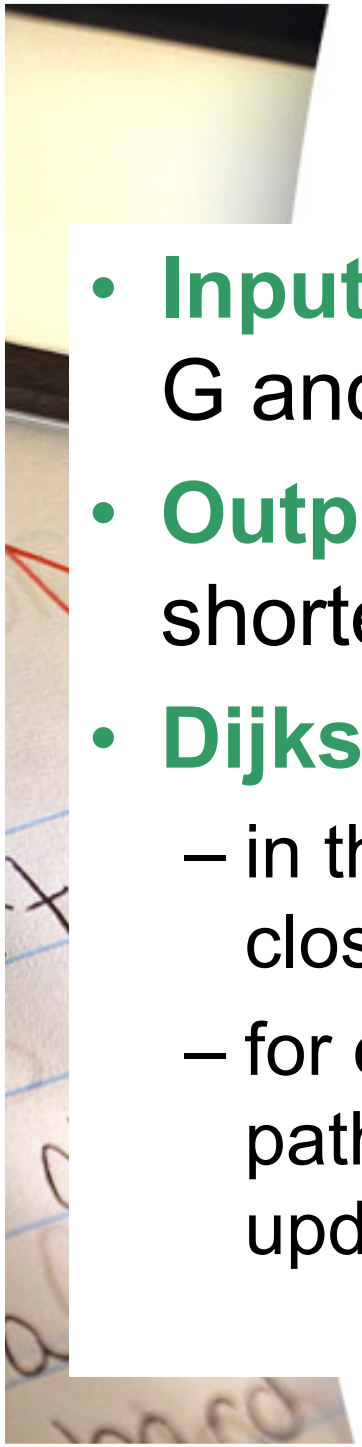
Greedy methods …

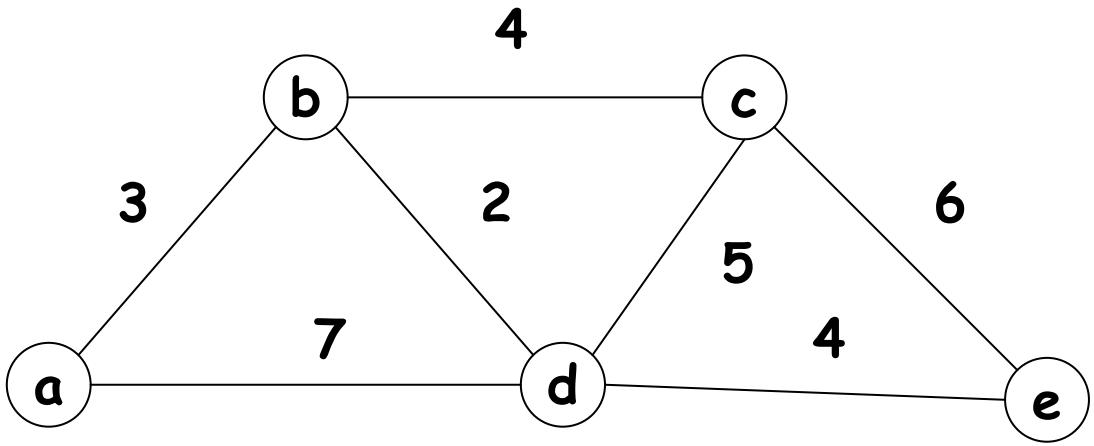


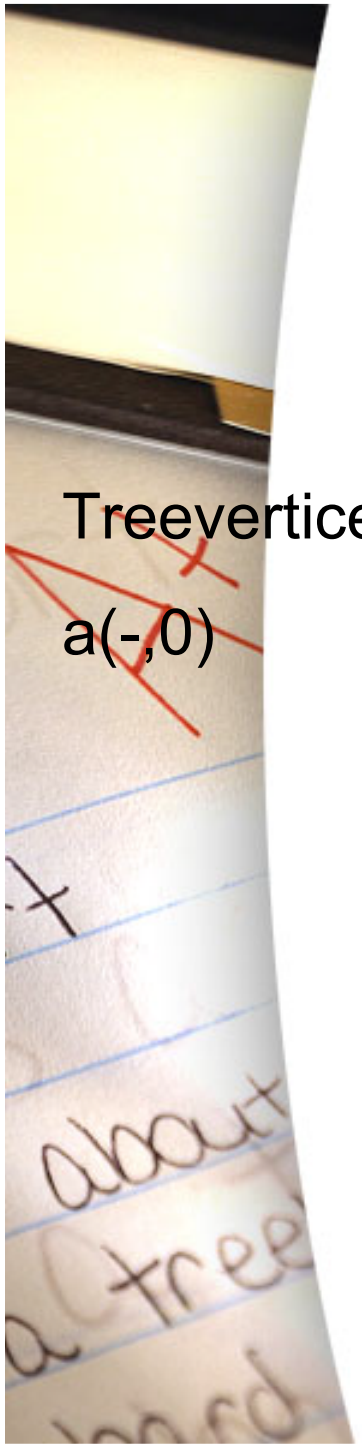


Dijkstra's algorithm

- **Input:** A directed connected weighted graph G and a source vertex ***s***
- **Output:** For every vertex ***v*** in G, find the shortest path from ***s*** to ***v***
- **Dijkstra's algorithm** runs in iterations:
  - in the i-th iteration, the vertex which is the i-th closest to ***s*** is found,
  - for every remaining vertices, the current shortest path to s found so far (this shortest path will be updated as the algorithm runs)

Dijkstra's algorithm

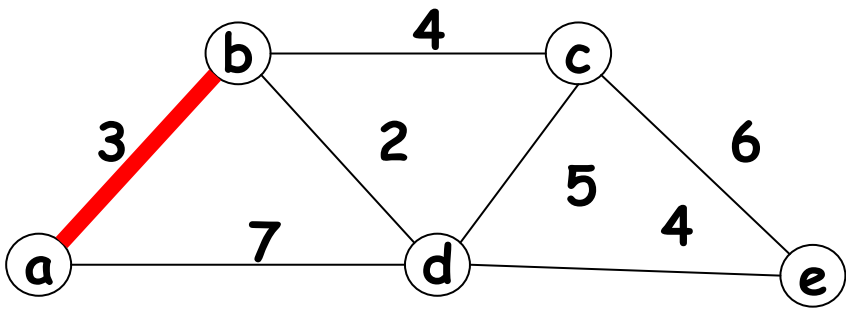


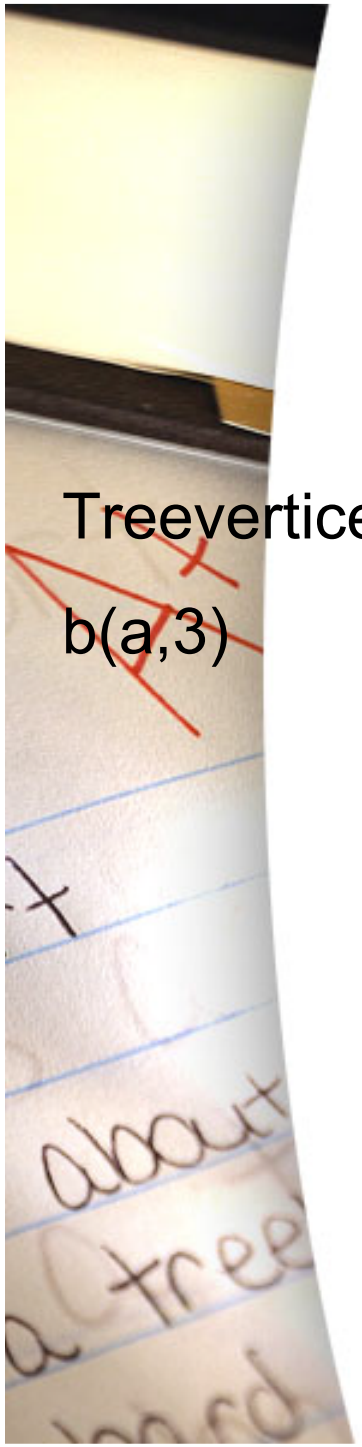


Dijkstra's algorithm

Ilustration

Treevertices	Remaining vertices
a(-,0)	**b(a,3)** c(-,∞) d(a,7)
	e(-, ∞)

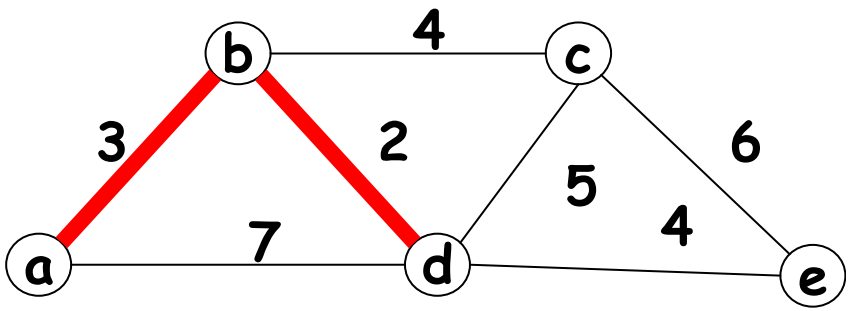


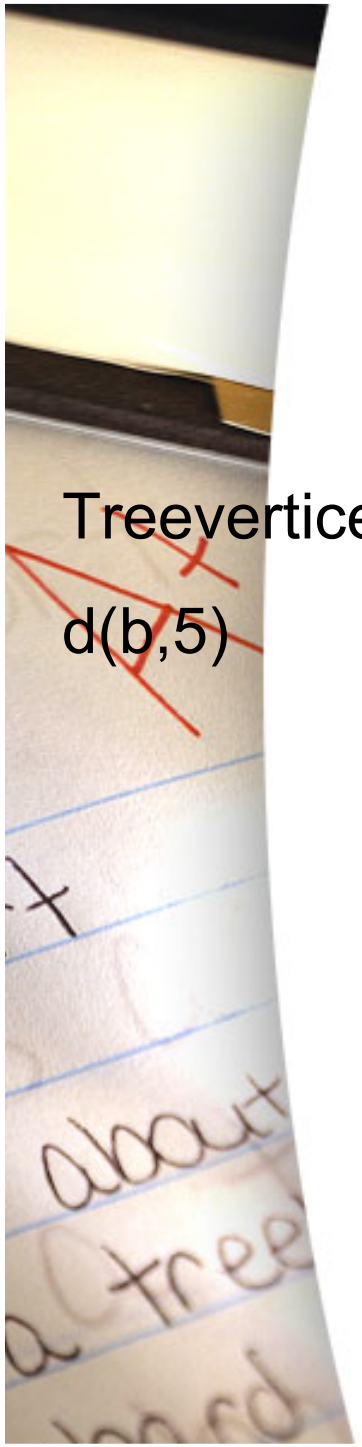


Dijkstra's algorithm

Treevertices	Remaining vertices
b(a,3)	c(b,3+4) **d(b,3+2)**
	e(-, ∞)

Ilustration

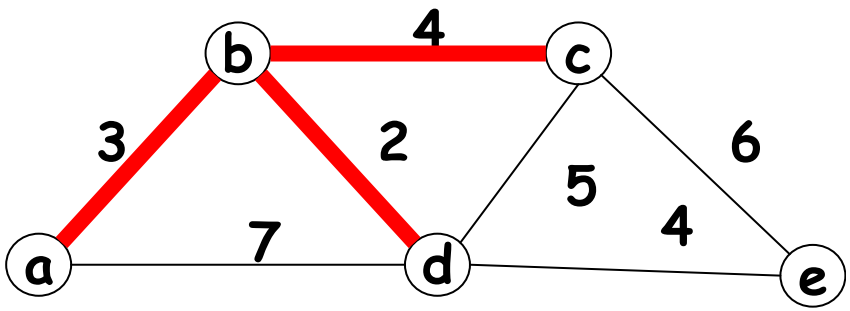


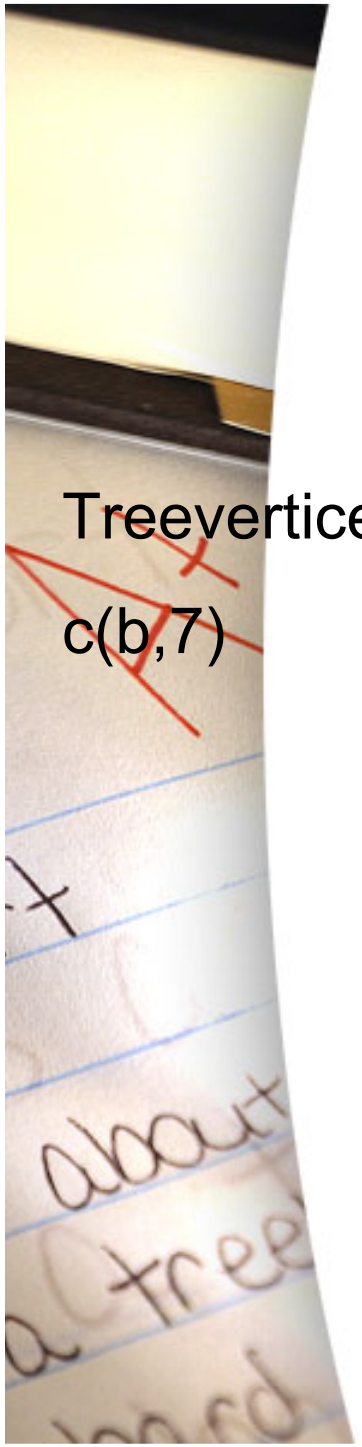


Dijkstra's algorithm

Illustration

Treevertices	Remaining vertices
d(b,5)	**c(b,7)** e(d, 5 + 4)

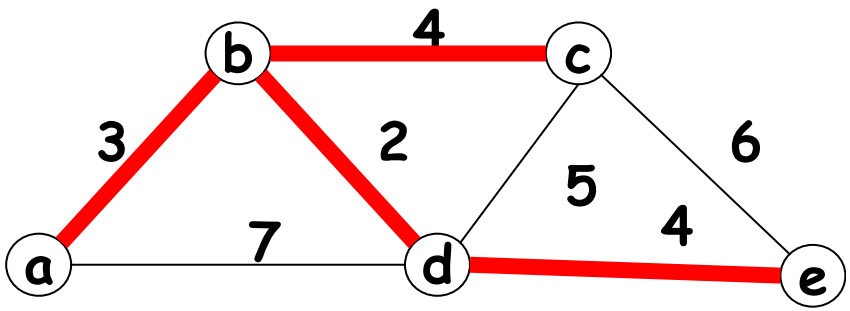




Dijkstra's algorithm

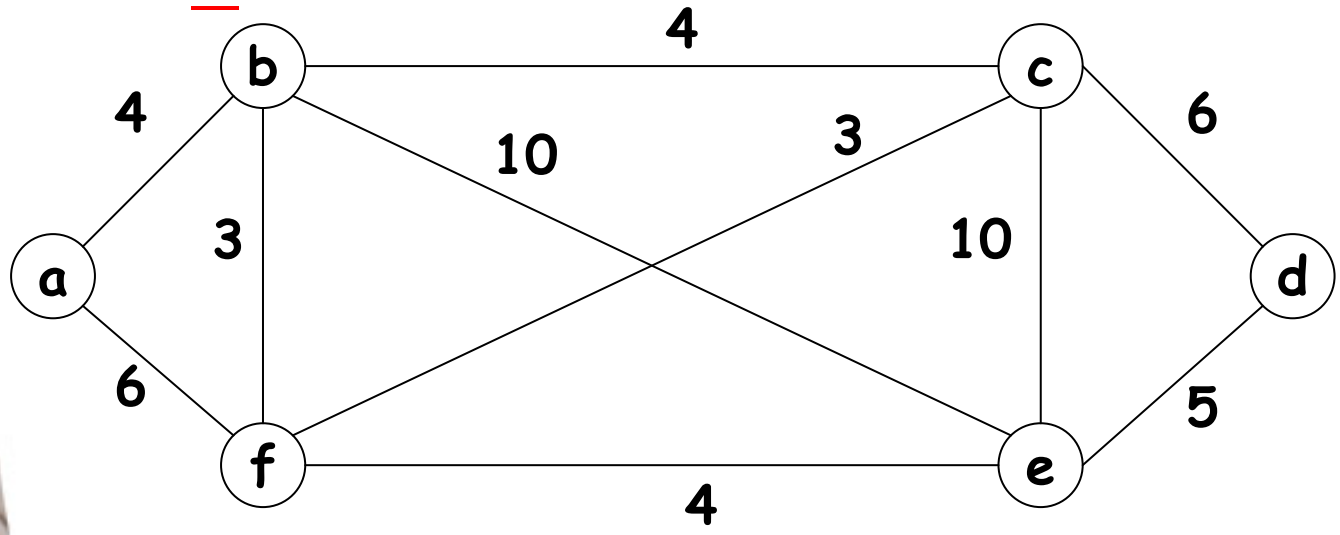
Ilustration

Treevertices	Remaining vertices
c(b,7)	e(d, 9)

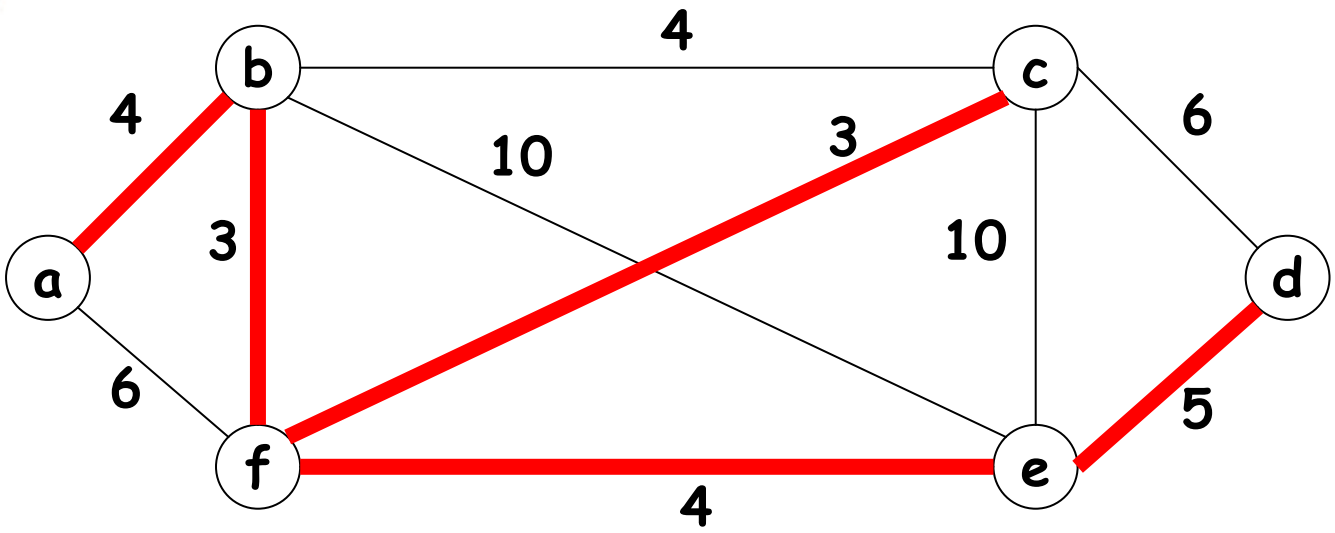


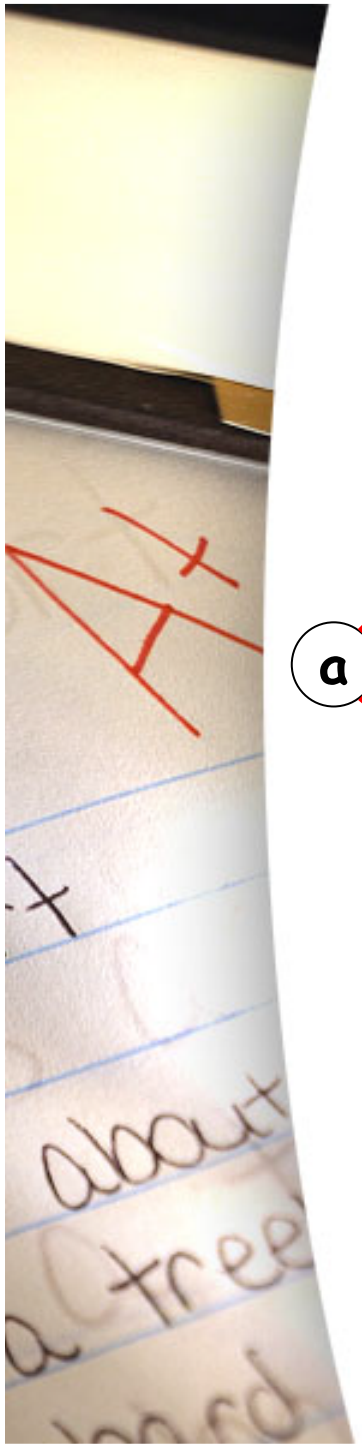
Exercise

1. Find an MST for this graph
2. Find the shortest paths from vertex ***a*** to all other vertices



Exercise - MST





Exercise – Shortest paths from a