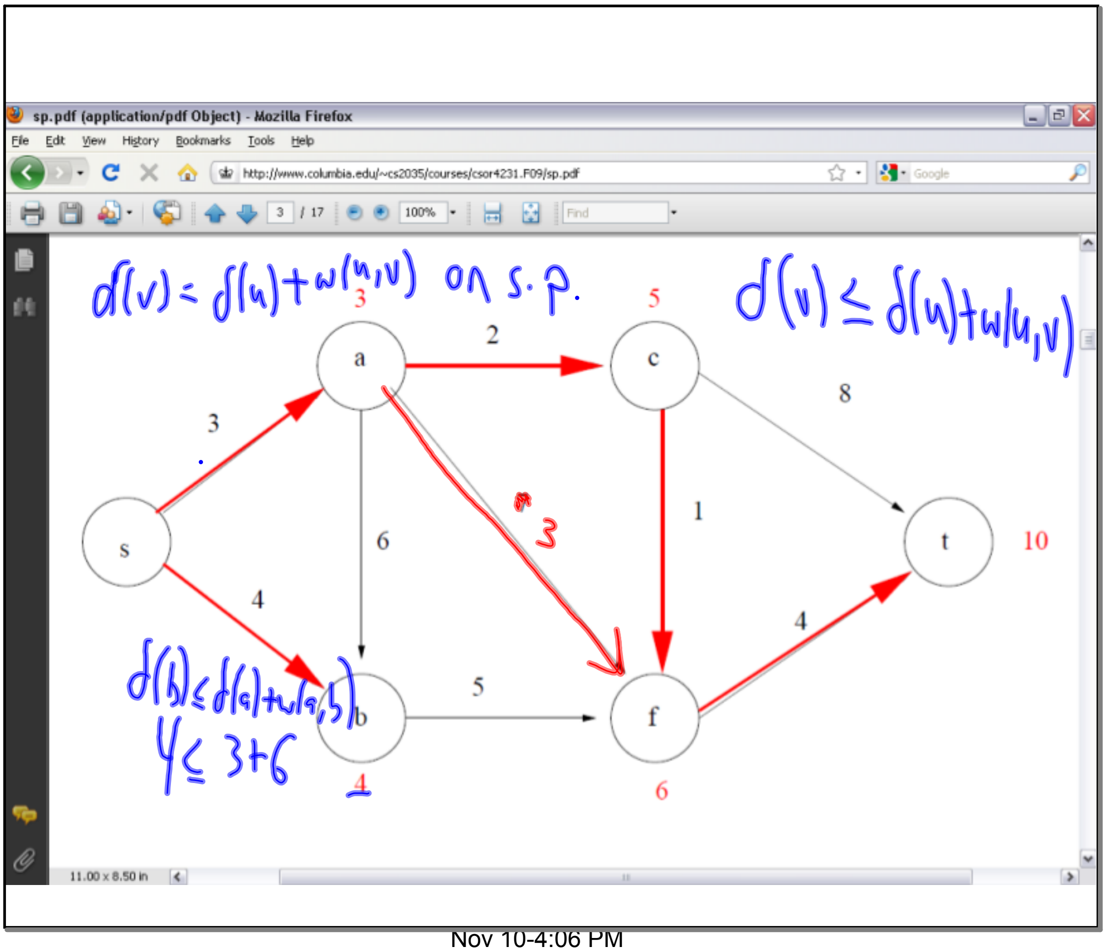
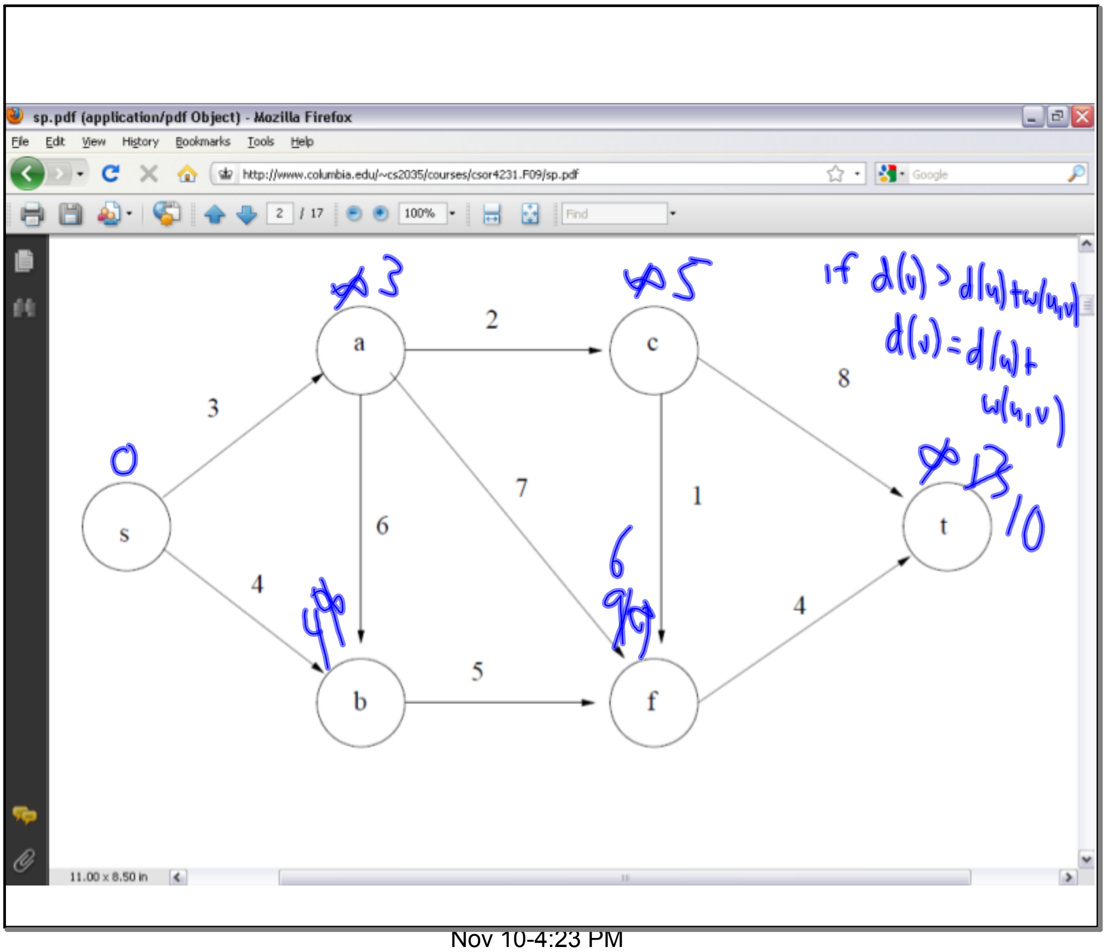
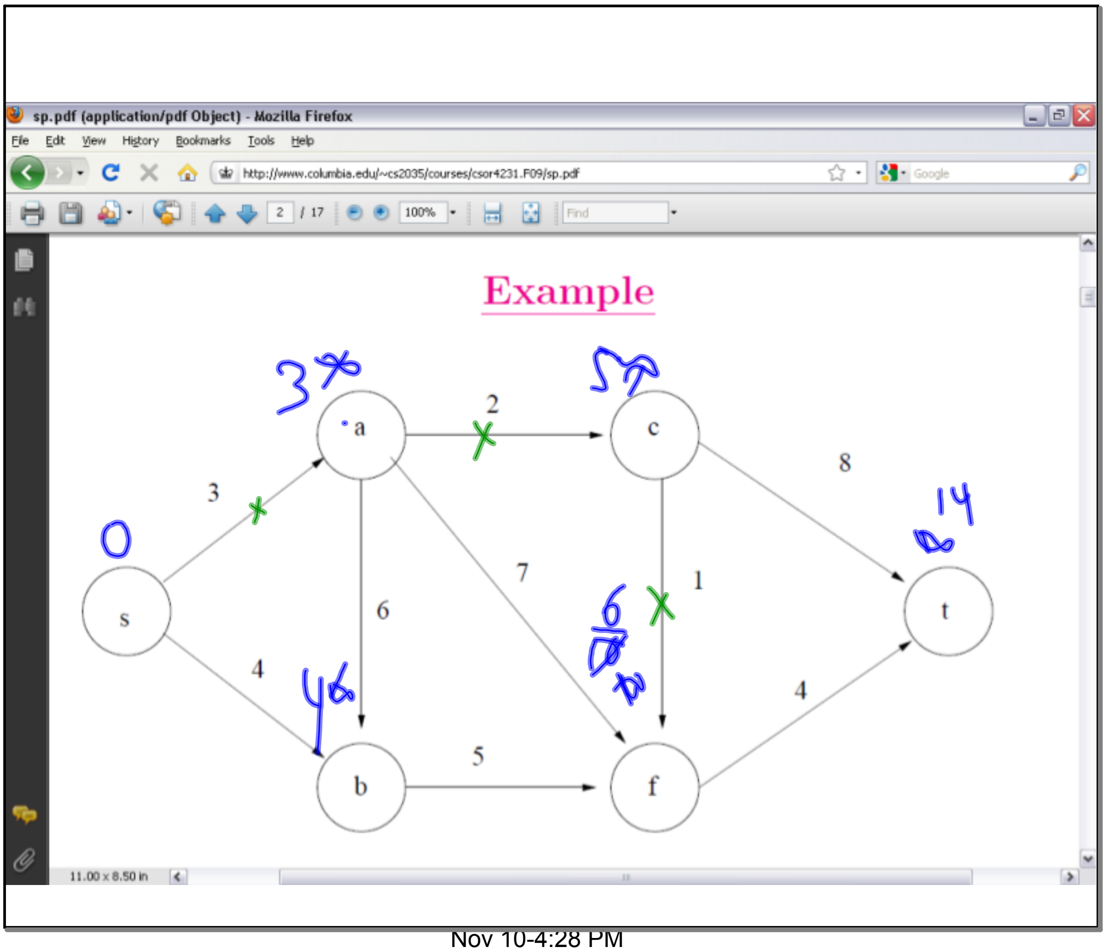


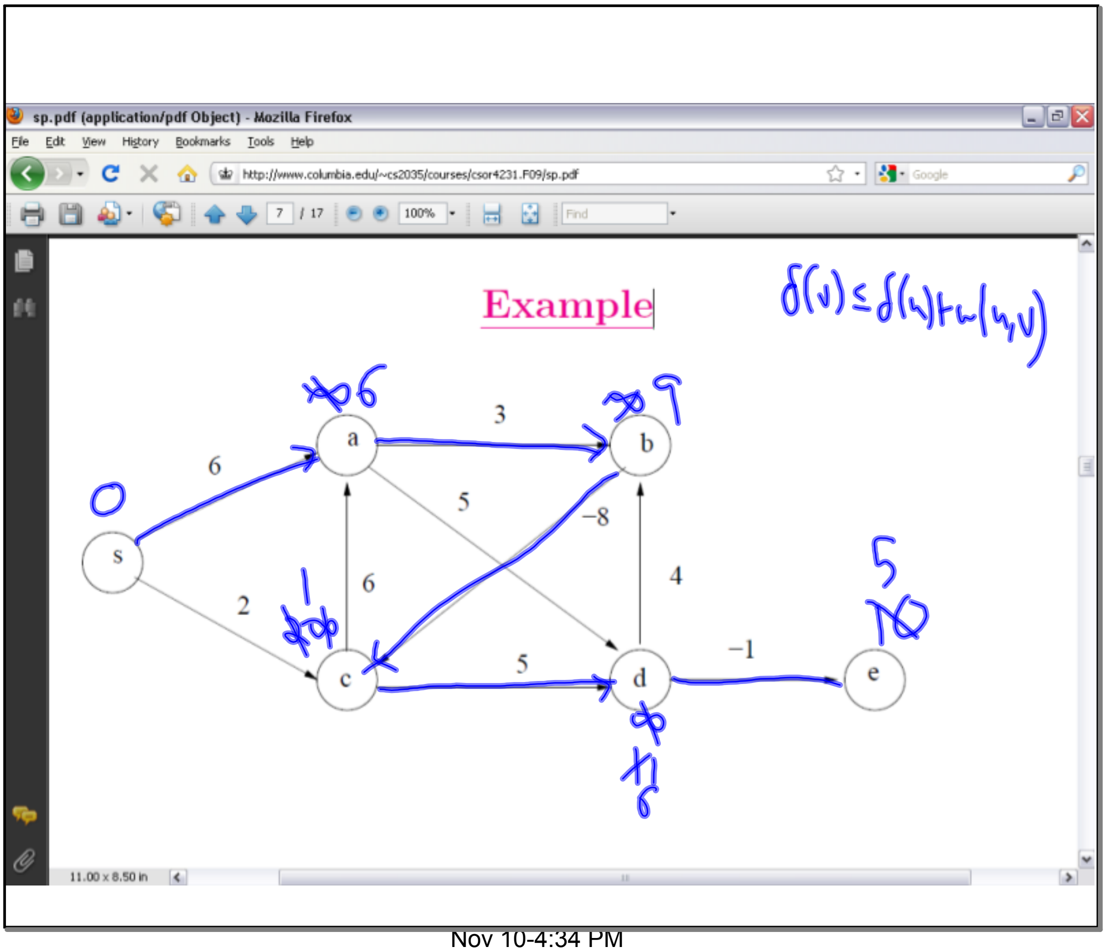
Nov 10-4:06 PM



Nov 10-4:23 PM



Nov 10-4:28 PM



Nov 10-4:34 PM

1... E

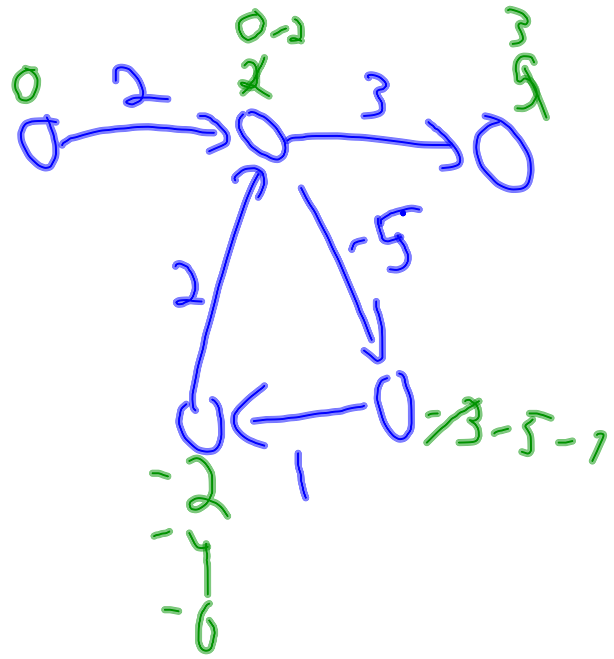
$\underbrace{1\,2\,3 \ldots E}\,\underbrace{1\,2 \ldots E}\,\underbrace{1\,2 \ldots E} \ldots\ldots \underbrace{1 \ldots E}$

V times

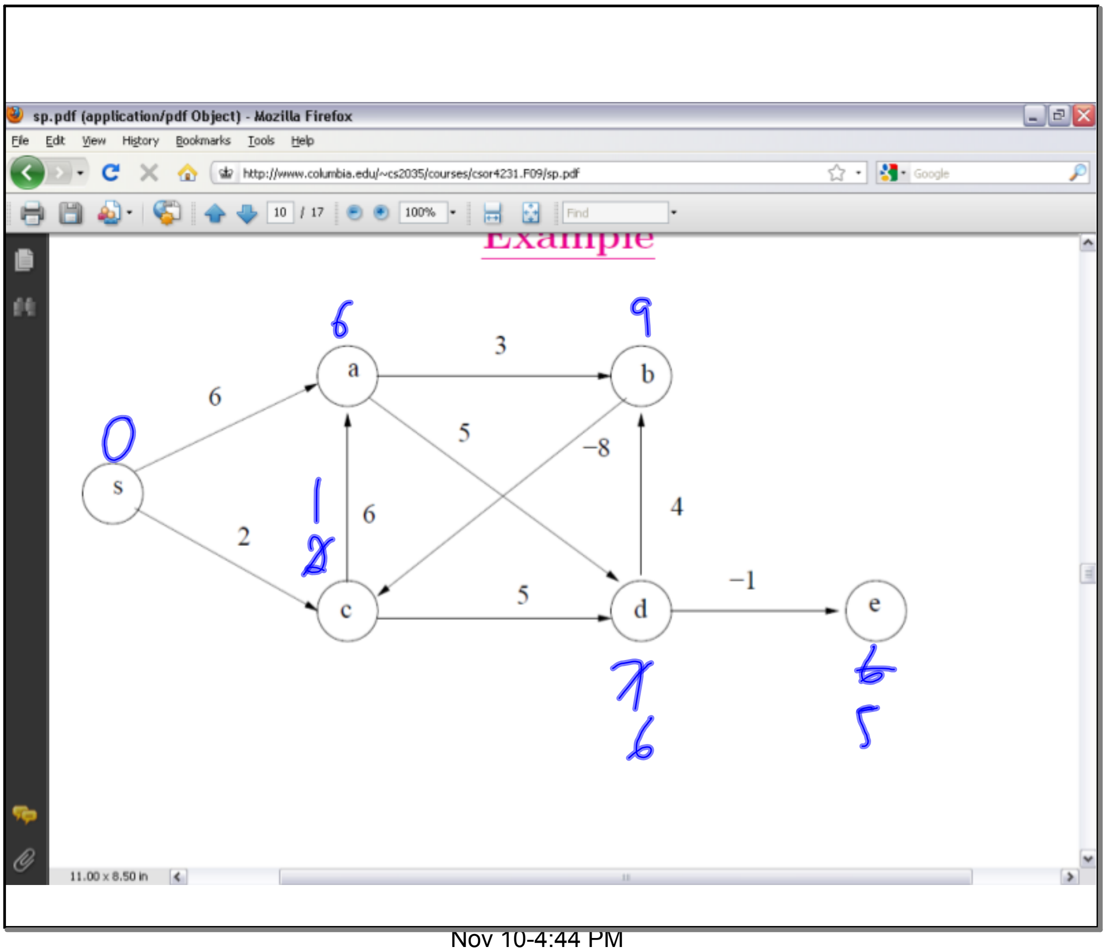
s.p. to 3

12, 1, 100, 101, 4, 5, 17, 3

Nov 10-4:35 PM



Nov 10-4:40 PM



Nov 10-4:44 PM

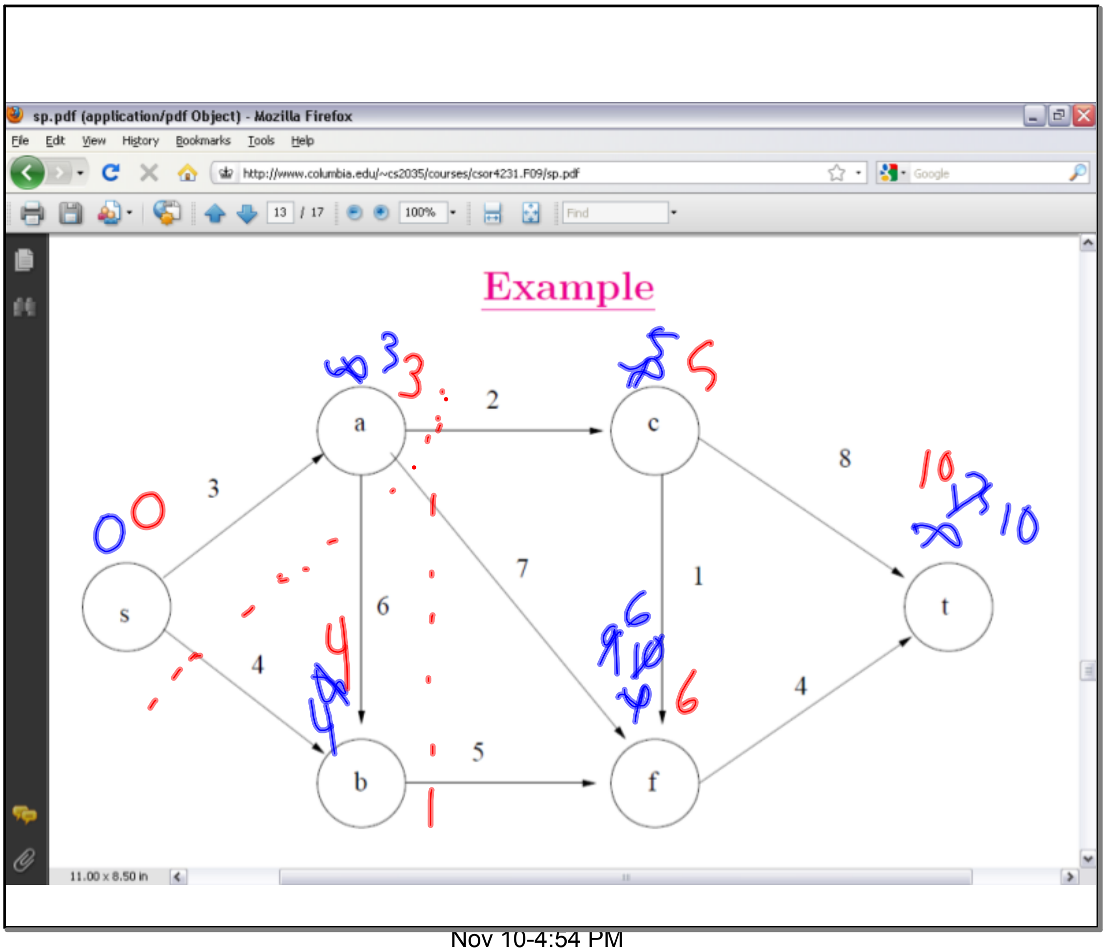
Dijkstra(G, w, s)

```
Initialize-Single-Source(G, s)
S ← ∅
Q ← V[G]
while Q ≠ ∅
    do u ← Extract-Min(Q)
       S ← S ∪ {u}
       for each vertex v ∈ Adj[u]
           do Relax(u, v, w)
```

3 3 5 5 6 10 6 8 4 4

$s \xrightarrow{10^{10}} t$

Nov 10-4:51 PM



Nov 10-4:54 PM

Dijkstra(G, w, s)

INITIALIZE-SINGLE-SOURCE(G, s)
  $S \leftarrow \emptyset$
  $Q \leftarrow V[G]$
  while $Q \neq \emptyset$ INSERTS
    do $u \leftarrow$ EXTRACT-MIN(Q)
      $S \leftarrow S \cup \{u\}$
      for each vertex $v \in Adj[u]$
        do RELAX(u, v, w) ← DECREASE-KEY

E Decrease key $O(E \lg V)$ heap

V INSERTS
V EXTRACT-MIN $O(E + V \lg V)$ fib-heap

Nov 10-4:56 PM

Claim When v is put in S (permanently labelled)

$$d(v) = \delta(v).$$

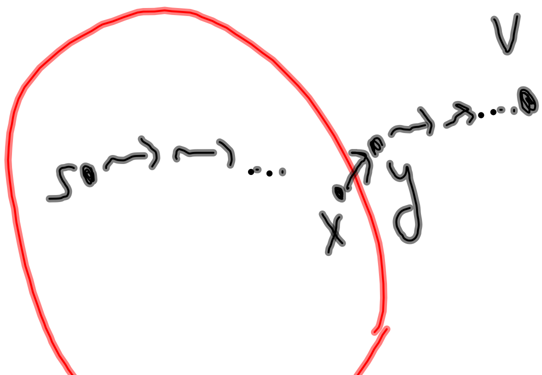
Pf

1. $d(v) \geq \delta(v)$ because any alg that does a series of Relax calls has this property

2. Assume fpoc that $d(v) > \delta(v)$, and this is the fist such vertex.

Nov 10-4:57 PM

Shortest s-v path just befor v is put in S



correct permanent labelling

$\delta(x) = d(x)$

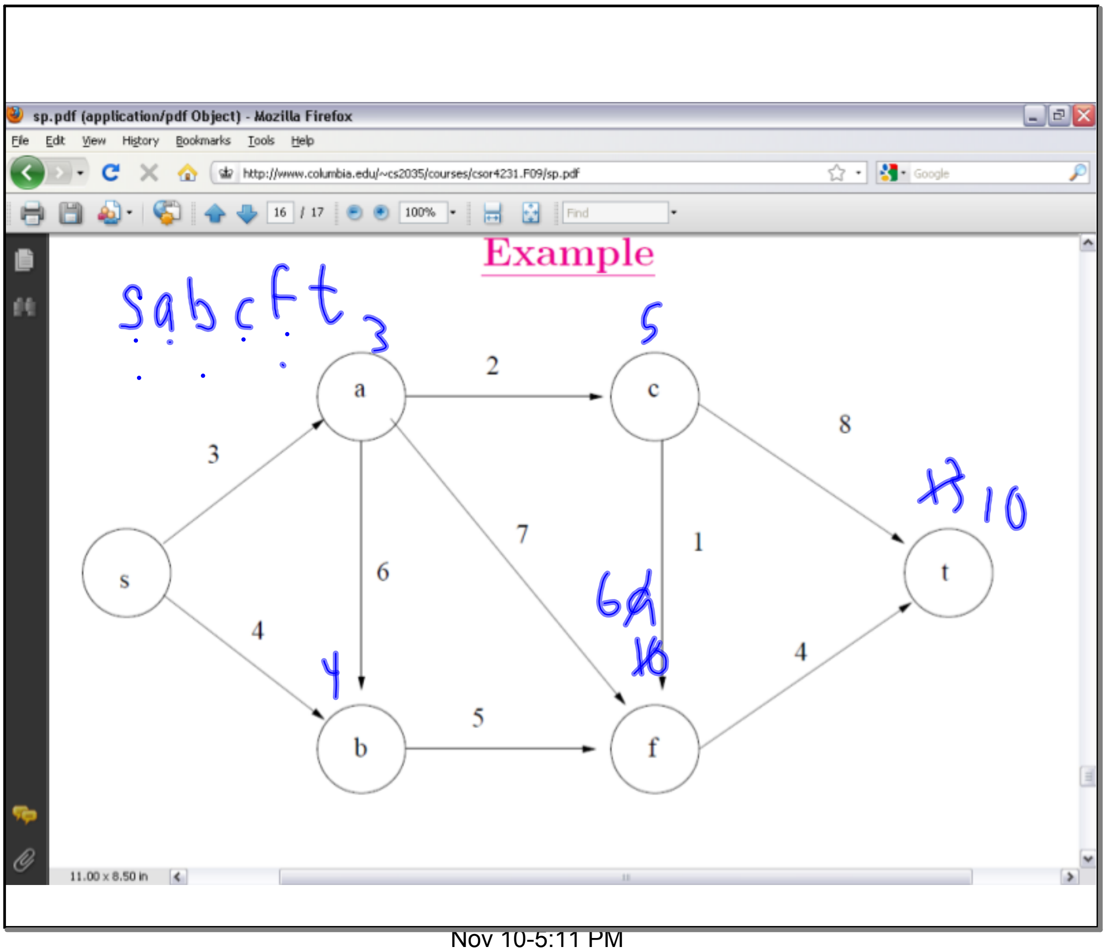
$\delta(y) = d(y)$ because (x,y) was relaxed when x was added to S.

$$d(y) = \delta(y) \leq \delta(v) < d(v)$$

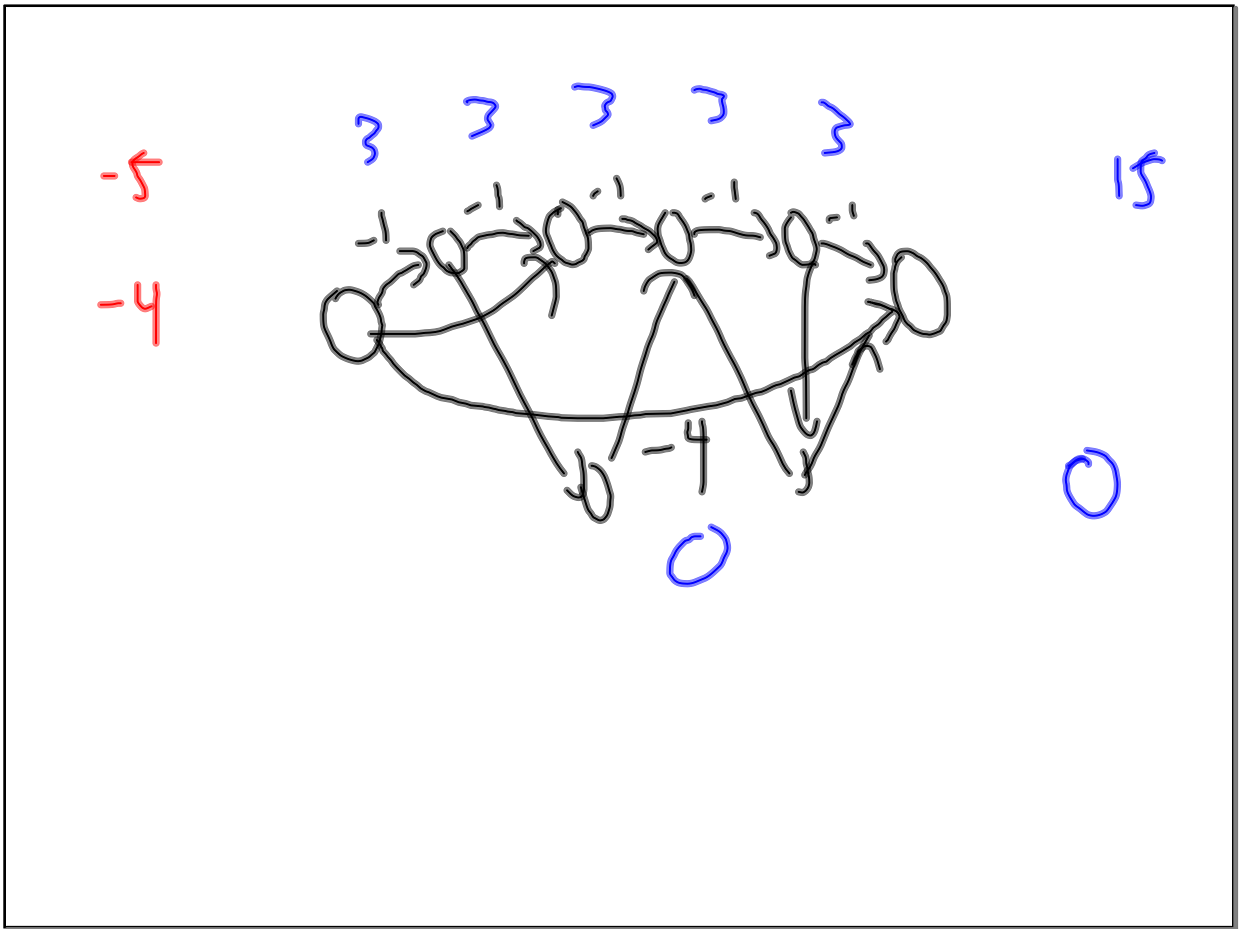
because y is on the s.p. to v.

$d(y) < d(v)$ and neither y nor v are in S, so Dijkstra's alg. will choose y & not v.

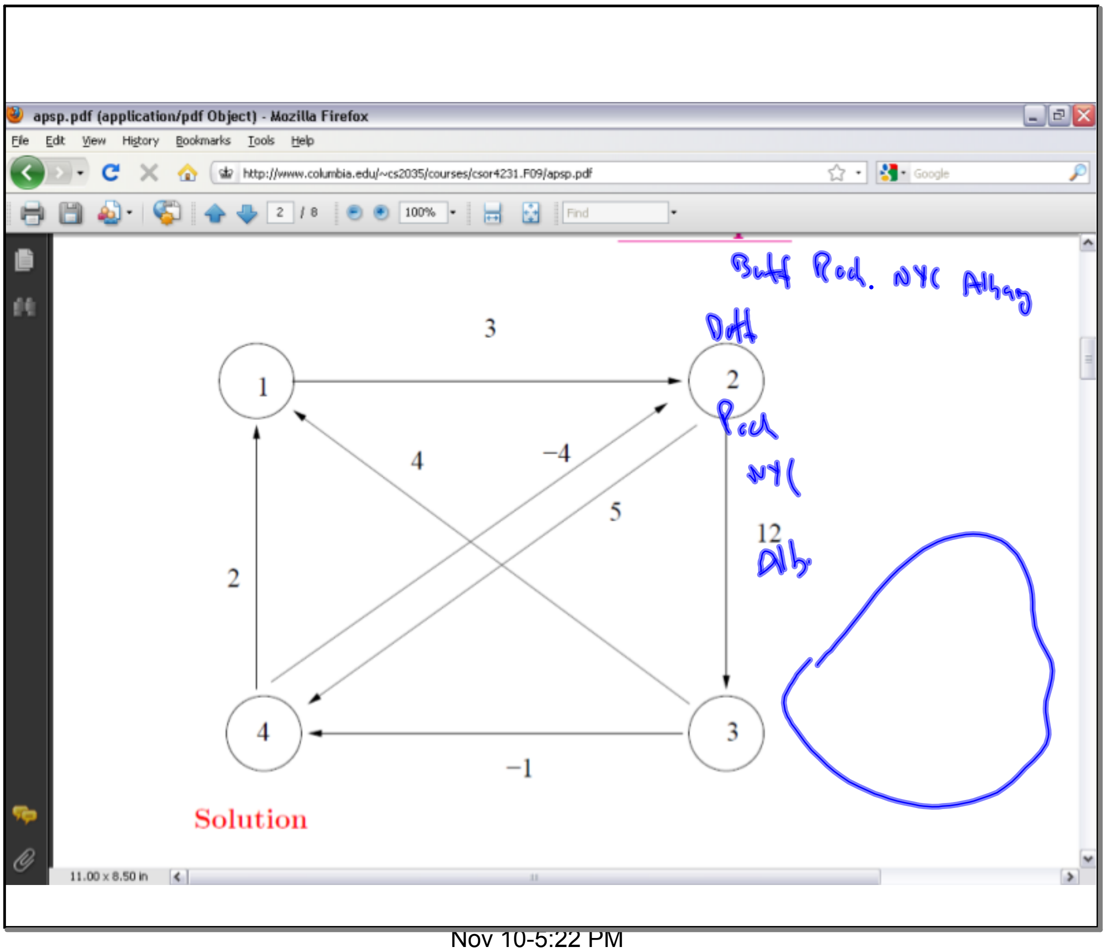
Nov 10-5:00 PM



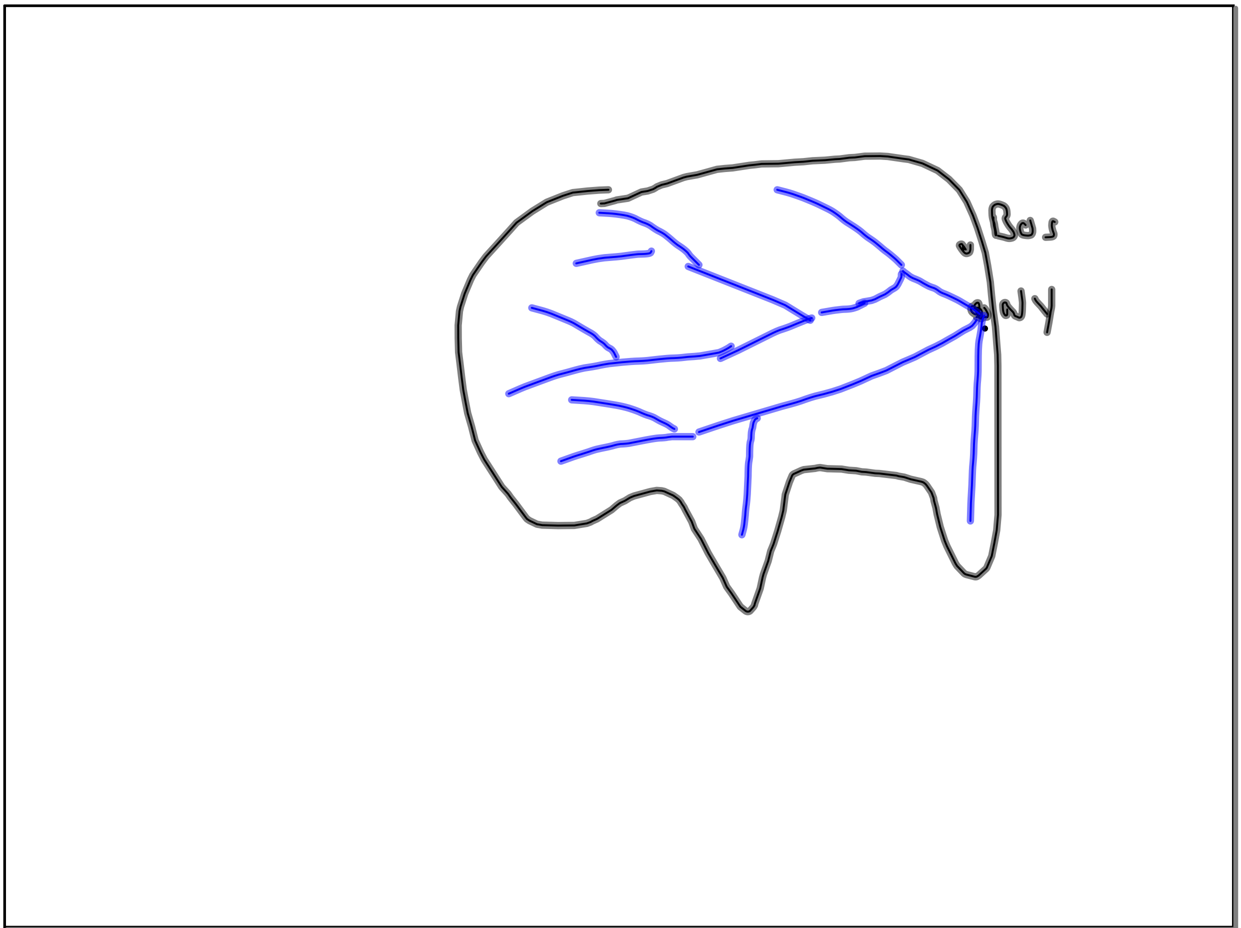
Nov 10-5:11 PM



Nov 10-5:15 PM



Nov 10-5:22 PM



Nov 10-5:22 PM