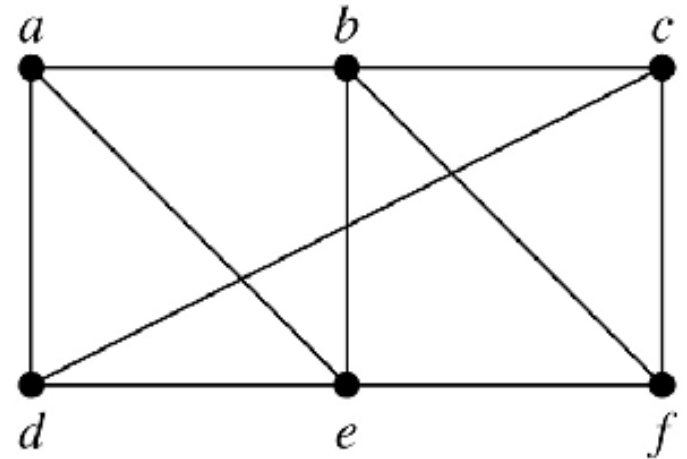


1. Simple paths?

- a.  $\{a,b\},\{b,f\},\{f,c\}$
- b.  $\{a,b\},\{b,c\},\{c,b\}$
- c.  $\{d,e\},\{e,a\},\{a,d\},\{d,e\}$



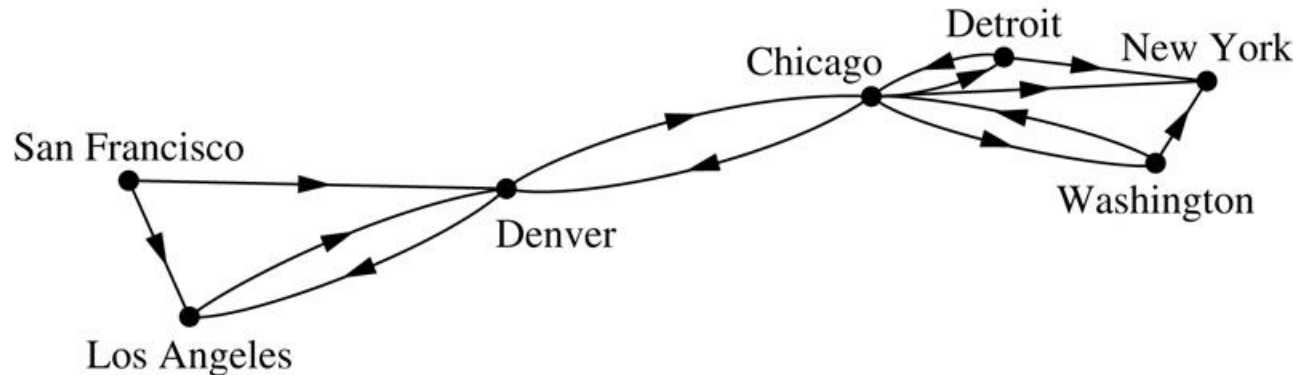
2. Simple circuits?

- a.  $\{a,b\},\{b,e\},\{e,a\}$
- b.  $\{d,e\},\{e,a\},\{a,d\}$
- c.  $\{d,e\},\{e,a\},\{a,d\},\{d,e\}$

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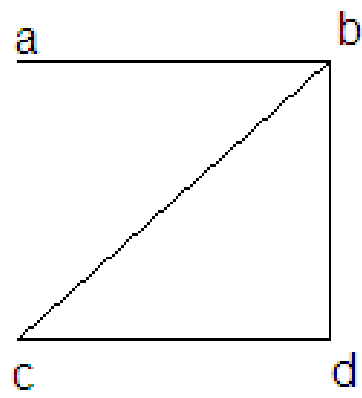
3. Strongly connected?

4. Weakly connected?



5. Find number of length 2 paths.

	a	b	c	d
a	0	1	0	0
b	1	0	1	1
c	0	1	0	1
d	0	1	1	0



7. Euler circuit?

8. Euler path?

9. Euler circuit?

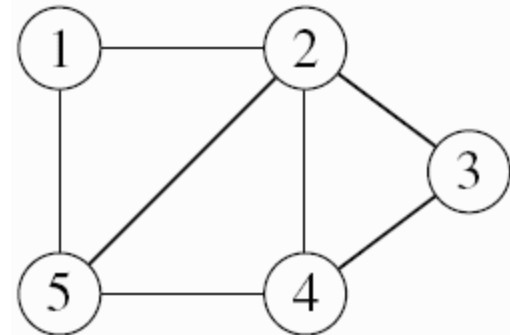
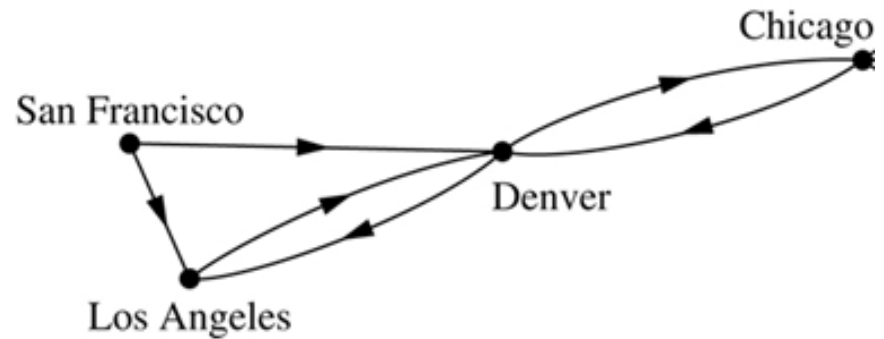
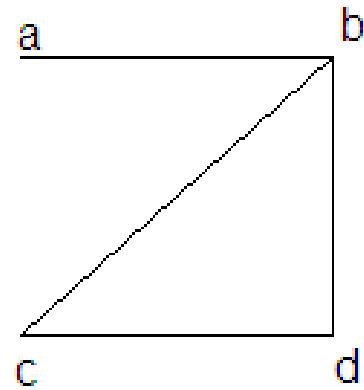
10. Euler path?

11. Hamiltonian circuit.

12. Hamiltonian path.

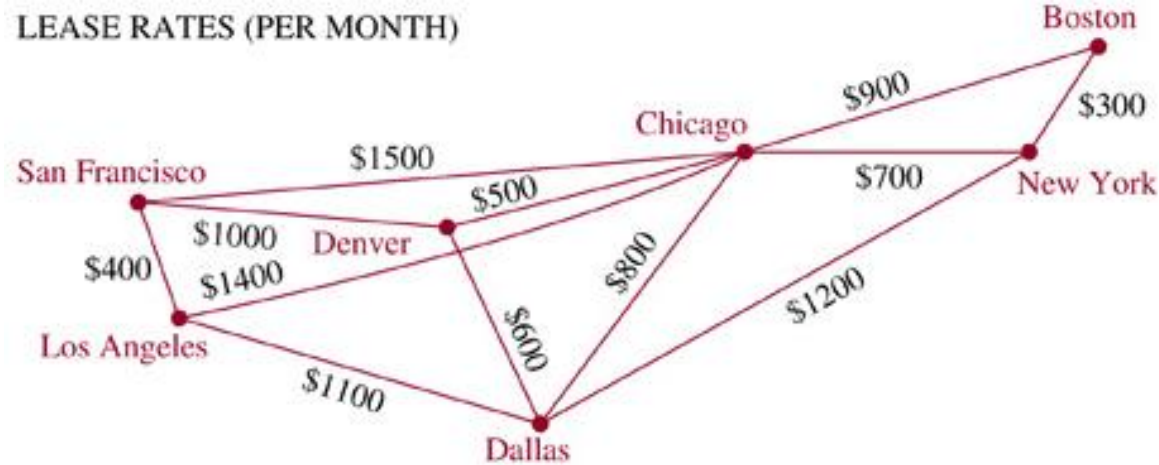
13. Hamiltonian circuit.

14. Hamiltonian path.



# 15. Denver to LA.

Vertices in S, in order added?



**procedure** Dijkstra( G : weighted connected simple graphs)

G has a path from a to z, weights  $w(v_i, v_j) = \infty$  if no edge  $(v_i, v_j)$

**for** i := 1 **to** n L( $v_i$ ) :=  $\infty$

L(a) := 0

S :=  $\emptyset$

**while** z  $\notin$  S

u := vertex not in S with L(u) minimal

S := S U {u}

**for** all vertices v not in S

**if** L(u) + w(u,v) < L(v) **then** L(v) := L(u) + w(u,v)

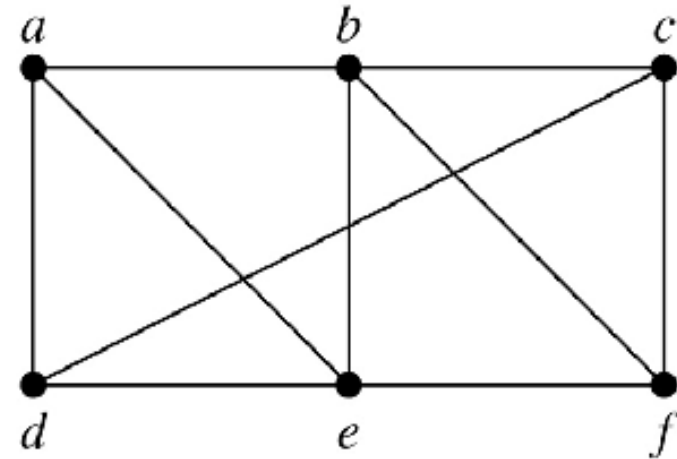
At the end of the **for** L(v) is minimal from L(u) for all v

1. Simple paths?

a.  $\{a,b\},\{b,f\},\{f,c\}$  Yes

b.  $\{a,b\},\{b,c\},\{c,b\}$  No

c.  $\{d,e\},\{e,a\},\{a,d\},\{d,e\}$  No



2. Simple circuits?

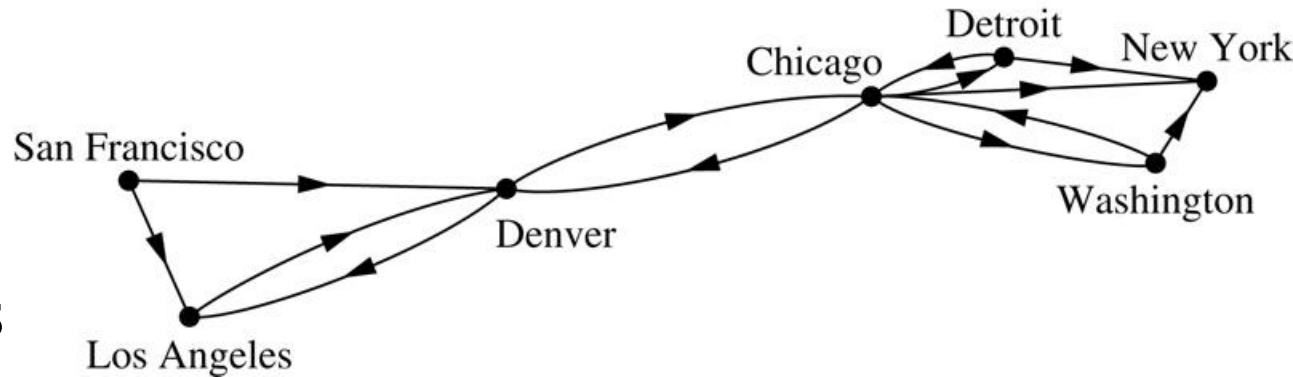
a.  $\{a,b\},\{b,e\},\{e,a\}$  Yes

b.  $\{d,e\},\{e,a\},\{a,d\}$  Yes

c.  $\{d,e\},\{e,a\},\{a,d\},\{d,e\}$  No

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3. Strongly connected? No



4. Weakly connected? Yes

5. Find number of length 2 paths.

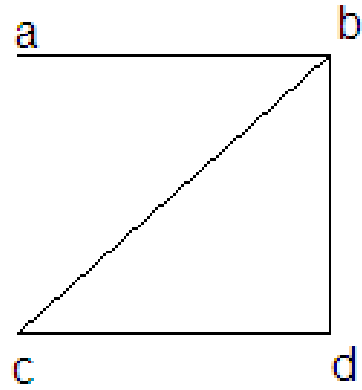
1 0 1 1

0 3 1 1

1 1 2 1

1 1 1 2

	a	b	c	d
a	0	1	0	0
b	1	0	1	1
c	0	1	0	1
d	0	1	1	0



7. Euler circuit? No

8. Euler path? Yes

9. Euler circuit? No

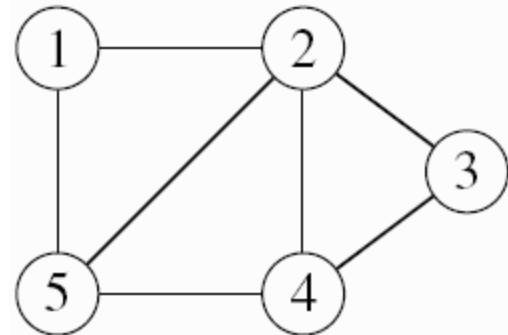
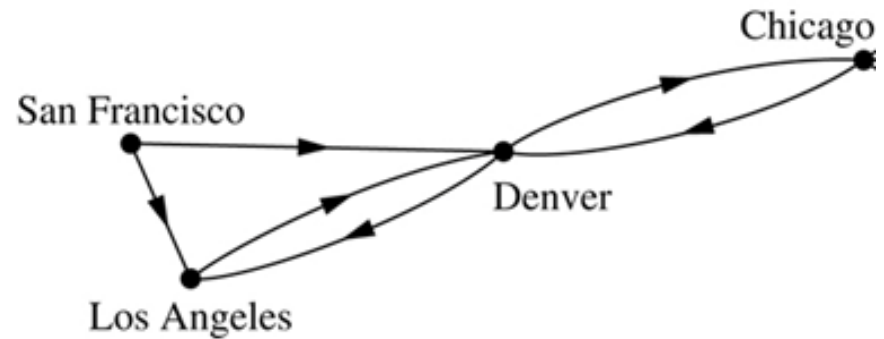
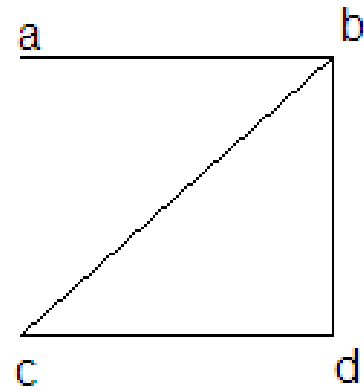
10. Euler path? No

11. Hamiltonian circuit. No

12. Hamiltonian path. Yes

13. Hamiltonian circuit. Yes

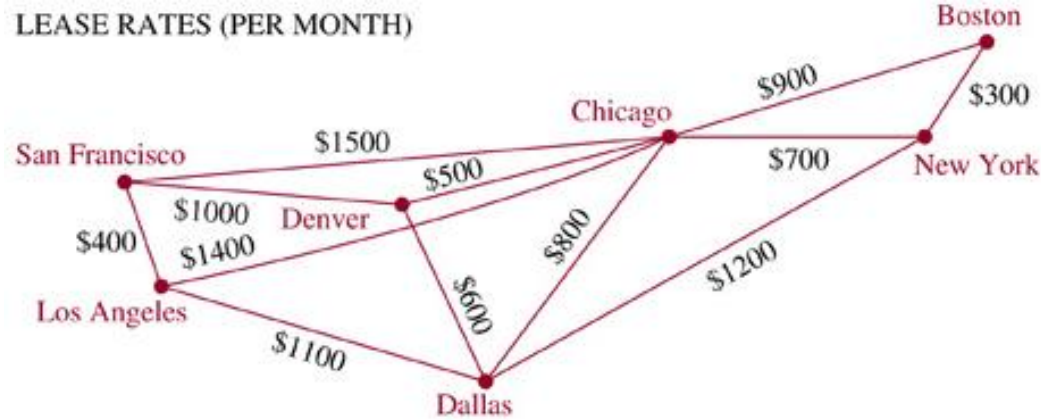
14. Hamiltonian path. Yes



# 15. Denver to LA.

Vertices in S, in order added?

Denver, Chicago, Dallas, SF, New York, LA



**procedure** Dijkstra( G : weighted connected simple graphs)

G has a path from a to z, weights  $w(v_i, v_j) = \infty$  if no edge  $(v_i, v_j)$

**for** i := 1 **to** n  $L(v_i) := \infty$

$L(a) := 0$

$S := \emptyset$

**while**  $z \notin S$

u := vertex not in S with  $L(u)$  minimal

$S := S \cup \{u\}$

**for** all vertices v not in S

**if**  $L(u) + w(u, v) < L(v)$  **then**  $L(v) := L(u) + w(u, v)$

At the end of the **for**  $L(v)$  is minimal from  $L(u)$  for all v