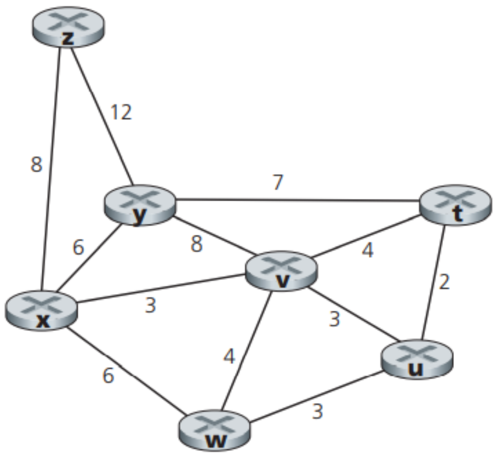
P3. Consider the following network. With the indicated link costs, use Dijkstra's shortest-path algorithm to compute the shortest path from x to all network nodes. Show how the algorithm works by computing a table similar to Table 5.1.



Step	N'	D(t),p(t)	D(u),p(u)	D(v),p(v)	D(w),p(w)	D(y),p(y)	D(z),p(z)
0	x	∞	∞	3,x	6,x	6,x	8,x
1	xv	7,v	6,v	3,x	6,x	6,x	8,x
2	xvu	7,v	6,v	3,x	6,x	6,x	8,x
3	xvuw	7,v	6,v	3,x	6,x	6,x	8,x
4	xvuwy	7,v	6,v	3,x	6,x	6,x	8,x
5	xvuwyt	7,v	6,v	3,x	6,x	6,x	8,x
6	xvuwytz	7,v	6,v	3,x	6,x	6,x	8,x

P4. Consider the network shown in Problem P3. Using Dijkstra's algorithm, and showing your work using a table similar to Table 5.1, do the following:

a. Compute the shortest path from t to all network nodes.
b. Compute the shortest path from u to all network nodes.
c. Compute the shortest path from v to all network nodes.
d. Compute the shortest path from w to all network nodes.
e. Compute the shortest path from y to all network nodes.
f. Compute the shortest path from z to all network nodes.

a)

Step	N'	D(x),p(x)	D(u),p(u)	D(v),p(v)	D(w),p(w)	D(y),p(y)	D(z),p(z)
0	t	∞	2,t	4,t	∞	7,t	∞
1	tu	∞	2,t	4,t	5,u	7,t	∞
2	tuv	7,v	2,t	4,t	5,u	7,t	∞
3	tuvw	7,v	2,t	4,t	5,u	7,t	∞
4	tuvwx	7,v	2,t	4,t	5,u	7,t	15,x

5	tuvwxy	7,v	2,t	4,t	5,u	7,t	15,x
6	tuvwxyz	7,v	2,t	4,t	5,u	7,t	15,x

b)

Step	N’	D(x),p(x)	D(t),p(t)	D(v),p(v)	D(w),p(w)	D(y),p(y)	D(z),p(z)
0	u	∞	2,u	3,u	3,u	∞	∞
1	ut	∞	2,u	3,u	3,u	9,t	∞
2	utv	6,v	2,u	3,u	3,u	9,t	∞
3	utvw	6,v	2,u	3,u	3,u	9,t	∞
4	utvwx	6,v	2,u	3,u	3,u	9,t	14,x
5	utvwxy	6,v	2,u	3,u	3,u	9,t	14,x
6	utvwxyz	6,v	2,u	3,u	3,u	9,t	14,x

c)

Step	N’	D(x),p(x)	D(u),p(u)	D(t),p(t)	D(w),p(w)	D(y),p(y)	D(z),p(z)
0	v	3,v	3,v	4,v	4,v	8,v	∞
1	vx	3,v	3,v	4,v	4,v	8,v	11,x
2	vxu	3,v	3,v	4,v	4,v	8,v	11,x
3	vxut	3,v	3,v	4,v	4,v	8,v	11,x
4	vxutw	3,v	3,v	4,v	4,v	8,v	11,x
5	vxutwy	3,v	3,v	4,v	4,v	8,v	11,x
6	vxutwyz	3,v	3,v	4,v	4,v	8,v	11,x

d)

Step	N’	D(x),p(x)	D(u),p(u)	D(v),p(v)	D(t),p(t)	D(y),p(y)	D(z),p(z)
0	w	6,w	3,w	4,w	∞	∞	∞
1	wu	6,w	3,w	4,w	5,u	∞	∞
2	wuv	6,w	3,w	4,w	5,u	12,v	∞
3	wuvt	6,w	3,w	4,w	5,u	12,v	∞
4	wuvtx	6,w	3,w	4,w	5,u	12,v	14,x
5	wuvtxy	6,w	3,w	4,w	5,u	12,v	14,x
6	wuvtxyz	6,w	3,w	4,w	5,u	12,v	14,x

e)

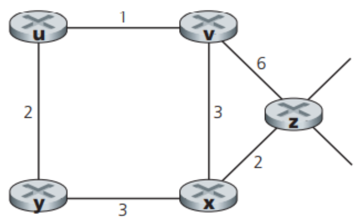
Step	N’	D(x),p(x)	D(u),p(u)	D(v),p(v)	D(w),p(w)	D(t),p(t)	D(z),p(z)
0	y	6,y	∞	8,y	∞	7,y	12,y
1	yx	6,y	∞	8,y	12,x	7,y	12,y
2	yxt	6,y	9,t	8,y	12,x	7,y	12,y
3	yxtv	6,y	9,t	8,y	12,x	7,y	12,y
4	yxtvu	6,y	9,t	8,y	12,x	7,y	12,y
5	yxtvuw	6,y	9,t	8,y	12,x	7,y	12,y
6	yxtvuwz	6,y	9,t	8,y	12,x	7,y	12,y

f)

Step	N’	D(x),p(x)	D(u),p(u)	D(v),p(v)	D(w),p(w)	D(y),p(y)	D(t),p(t)

0	z	8,z	∞	∞	∞	12,z	∞
1	zx	8,z	∞	11,x	14,x	12,z	∞
2	zxv	8,z	14,v	11,x	14,x	12,z	15,v
3	zxvy	8,z	14,v	11,x	14,x	12,z	15,v
4	zxvyu	8,z	14,v	11,x	14,x	12,z	15,v
5	zxvyuw	8,z	14,v	11,x	14,x	12,z	15,v
6	zxvyuwt	8,z	14,v	11,x	14,x	12,z	15,v

P5. Consider the network shown below, and assume that each node initially knows the costs to each of its neighbors. Consider the distance-vector algorithm and show the distance table entries at node z

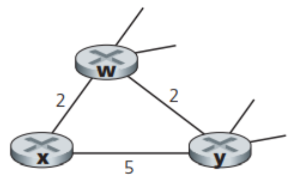


	U	V	X	Y	z
V	∞	∞	∞	∞	∞
X	∞	∞	∞	∞	∞
z	∞	6	2	∞	0

	U	V	X	Y	z
V	1	0	3	∞	6
X	∞	3	0	3	2
z	7	5	2	5	0

	U	V	X	Y	z
V	1	0	3	3	5
X	4	3	0	3	2
z	6	5	2	5	0

P7. Consider the network fragment shown below. x has only two attached neighbors, w and y. w has a minimum-cost path to destination u (not shown) of 5, and y has a minimum-cost path to u of 6. The complete paths from w and y to u (and between w and y) are not shown. All link costs in the network have strictly positive integer values.



a. Give x's distance vector for destinations w, y, and u.

b. Give a link-cost change for either c(x,w) or c(x,y) such that x will inform its neighbors of a new minimum-cost path to u as a result of executing the distance-vector algorithm.

c. Give a link-cost change for either c(x,w) or c(x,y) such that x will not inform its neighbors of a new minimum-cost path to u as a result of executing the distance-vector algorithm.

a) Dx(w) = 2, Dx(y) = 4, Dx(u) = 7

b) node x again informs its neighbors of the new cost.

c) not cause x to inform its neighbors of a new minimum-cost path to u.

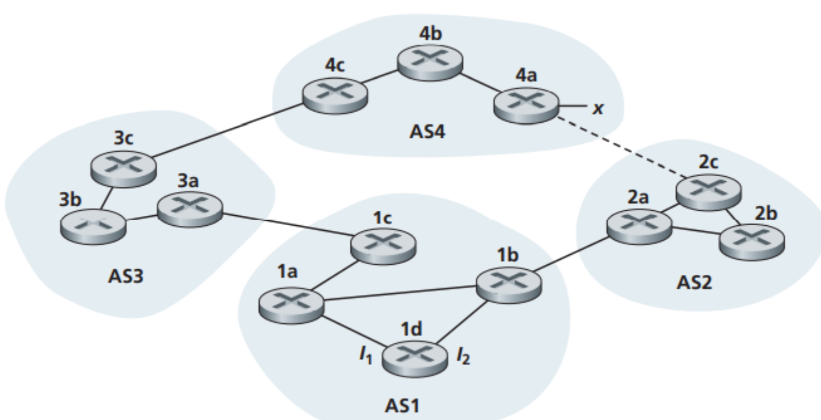
P14. Consider the network shown below. Suppose AS3 and AS2 are running OSPF for their intra-AS routing protocol. Suppose AS1 and AS4 are running RIP for their intra-AS routing protocol. Suppose eBGP and iBGP are used for the inter-AS routing protocol. Initially suppose there is no physical link between AS2 and AS4.

a. Router 3c learns about prefix x from which routing protocol: OSPF, RIP, eBGP, or iBGP?

b. Router 3a learns about x from which routing protocol?

c. Router 1c learns about x from which routing protocol?

d. Router 1d learns about x from which routing protocol?



a) eBGP

b) eBGP

c) eBGP

d) iBGP