

1. Three properties of a tree:

- Have node, branch, leaves
- A connected, undirected graph that is acyclic.
- A tree is a forest, but a forest is not a tree.

2. Yes

3. Root

4. One

5. Yes

6. 13, 6, 60

7. 7

8. None

9. 4, 12, 7, 22

10. 13, 6, 60, 23, 21

11. 23, 6, 21, 20, 9, 1

12. 22, 16, 7, 13, 60, 12, 4

13. 3

14. 3

15. 4

16. 6

17. No

18. No

19. No

20. No

21. Yes

22. n^h

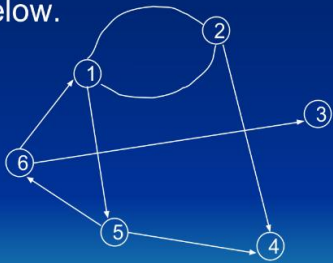
23. $\log_n m$

24. $\frac{n^h-1}{n-1}$

25. $n^h - 1$

Exercise

Give the formal description of the directed graph below.



$$G_9 = (V_9, E_9)$$

$$V_9 = \{1, 2, 3, 4, 5, 6\}$$

$$E_9 = \{(1, 2), (1, 5), (2, 1), (2, 4), (3, 1), (5, 4), (5, 6), (6, 1), (6, 3)\}$$

Graph G_9

Indegree:

1 is 2

2 is 1

3 is 1

4 is 2

5 is 1

6 is 1

Outdegree:

1 is 2

2 is 2

3 is 0

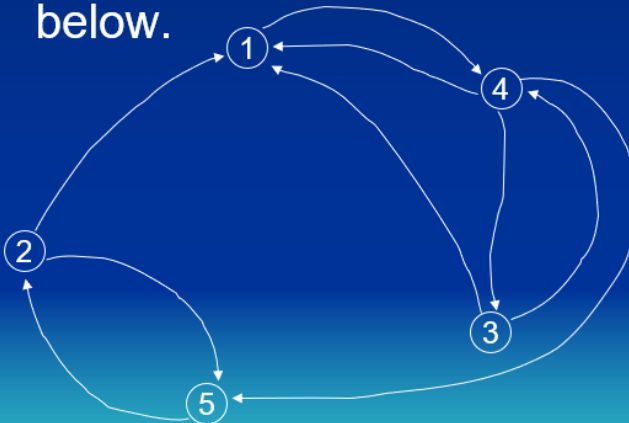
4 is 0

5 is 2

6 is 2

Exercise

Give the formal description of the directed graph below.



$$G_{10} = (V_{10}, E_{10})$$

$$V_{10} = \{1, 2, 3, 4, 5\}$$

$$E_{10} = \{(1, 4), (2, 1), (2, 5), (3, 1), (3, 4), (4, 1), (4, 3), (4, 5), (5, 2), (5, 3)\}$$

Graph G_{10}

Indegree:

1 is 3

2 is 1

3 is 1

4 is 2

5 is 2

Outdegree:

1 is 1

2 is 2

3 is 2

4 is 3

5 is 1

Graphs

Graph G_{29}

Kruskal's Algorithm: Total = 197

$$w(b,c) = 1$$

$$w(n,m) = 1$$

$$w(g,i) = 5$$

$$w(d,l) = 6$$

$$w(c,m) = 8$$

$$w(f,i) = 9$$

$$w(a,b) = 11$$

$$w(d,k) = 13$$

$$w(c,d) = 14$$

$$w(g,j) = 16$$

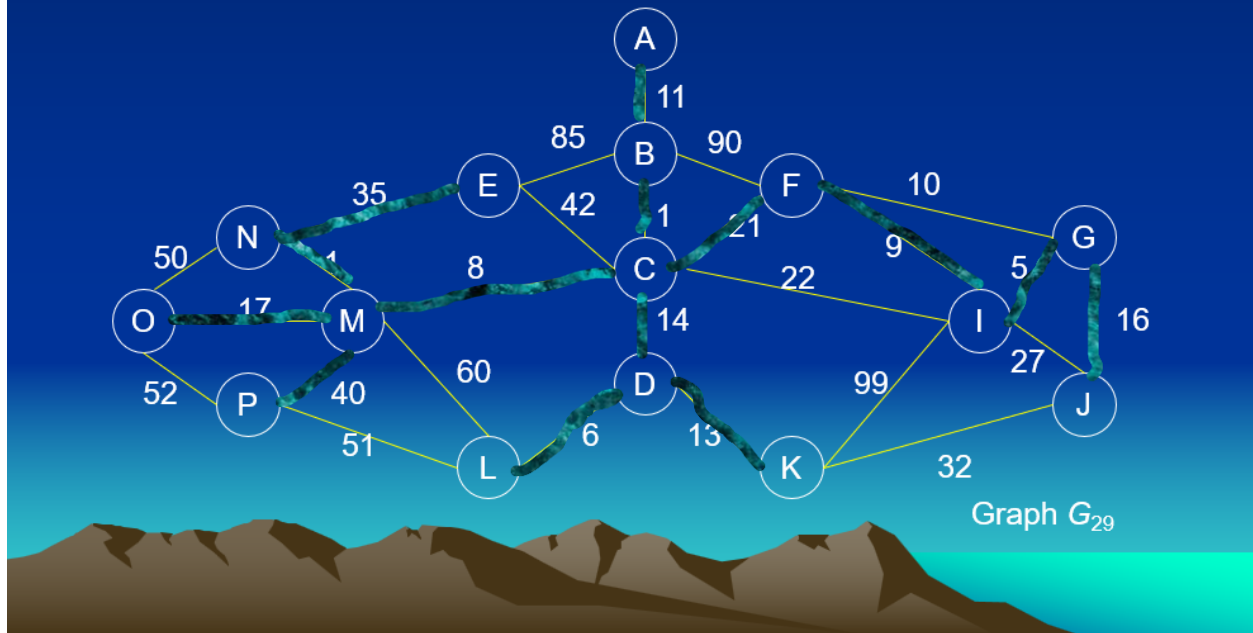
$$w(o,m) = 17$$

$$w(c,f) = 21$$

$$w(e,n) = 35$$

$$w(m,p) = 40$$

Graphs



Prim's Algorithm: Total = 197

$$w(a,b) = 11$$

$$w(b,c) = 1$$

$$w(c,m) = 8$$

$$w(m,n) = 1$$

$$w(c,d) = 14$$

$$w(d,l) = 6$$

$$w(d,k) = 13$$

$$w(m,o) = 17$$

$$w(c,f) = 21$$

$$w(f,i) = 9$$

$$w(i,g) = 5$$

$$w(g,j) = 16$$

$$w(e,n) = 35$$

$$w(m,p) = 40$$

