Unit 13 - Week -9 : Power Laws and Rich-Get-Richer Phenomena

Week 9 - Assignment 1

1) In G(1000, 0.1) random network, each edge will be placed with the probability *1 point*

- 0.1
- 0.9
- 0.5
- 0.7

Accepted Answers:
0.1

2) Which of the following distributions depict a normal/bell curve? *1 point*

- Weights of people in a city
- Heights of people in a city
- Intelligence quotients of people in a city
- All of the above

Accepted Answers:
All of the above

3) Given a random graph on 1000 nodes where each of the possible $\binom{1000}{2}$ edges is present with a probability of 0.1. Let N_1 represent the number of nodes having the least degree (i.e. 0), N_2 represent the number of nodes having the highest degree (i.e. 999) and N_3 represent the number of nodes having the median values of degrees (i.e. 499 or 500). Choose the correct statement. *1 point*

- $N_1 > N_3$ and $N_2 > N_3$
- $N_1 < N_3$ and $N_2 < N_3$
- $N_1 > N_3$ and $N_2 < N_3$
- $N_1 < N_3$ and $N_2 > N_3$

Accepted Answers:

$N_1 < N_3$ *and* $N_2 < N_3$

4) Given the World Wide Web (WWW) network. Let N_1 represent the number of nodes having the least degree, N_2 represent the number of nodes having the highest degree and N_3 represent the number of nodes having the median values of degrees. Choose the correct statement. ***1 point***

- $N_1 > N_3$ and $N_2 > N_3$
- $N_1 < N_3$ and $N_2 < N_3$
- $N_1 > N_3$ and $N_2 < N_3$
- $N_1 < N_3$ and $N_2 > N_3$

Accepted Answers:
$N_1 > N_3$ *and* $N_2 < N_3$

5) Given set E = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}. We pick a value a_1| uniformly at random from this set E. Next, we pick another value a_2 , again uniformly at random from this set E. Similarly we pick 8 more values, $a_3, a_4, \ldots\ldots, a_9, a_{10}$. Look at the sum, $S = a_1 + a_2 + \ldots + a_9 + a_{10}$. Which of the following sets define the range from which the sum S can have values from? ***1 point***

- {1, 2, ..., 9, 10}
- {10, 11, ..., 19, 20}
- {1, 2, ..., 9, 100}
- {10, 11, ..., 99, 100}

Accepted Answers:
{10, 11, ..., 99, 100}

6) Given set E = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}. We pick a value a_1| uniformly at random from this set E. Next, we pick another value a_2 , again uniformly at random from this set E. Similarly we pick 8 more values, $a_3, a_4, \ldots\ldots, a_9, a_{10}$. Look at the sum, $a_1 + a_2 + \ldots + a_9 + a_{10}$. Let p(i) be the probability that S = i, i.e., the probability that the sum of these randomly chosen 10 elements is i. Which of the following is true? ***1 point***

- p(50) < p(100)
- p(100) < p(50)
- p(50) < p(10)
- p(100) < p(10)

Accepted Answers:
p(100) < p(50)

7) Given set E = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}. We pick a value a_1| uniformly at random from this set E. Next, we pick another value a_2 , again uniformly at random from this set E. Similarly we pick 8 more values, $a_3, a_4, \ldots\ldots, a_9, a_{10}$. Look at the sum, $a_1 + a_2 + \ldots + a_9 + a_{10}$. Let p(i) be the probability that S = i, i.e., the probability that the sum of these randomly chosen 10 elements is i. We plot i on the X-axis and p(i) on the Y axis. Choose the correct statement from the following. ***1 point***

- The plot has very high values in the beginning but then drops.
- The plot is a constant curve.
- The plot is a bell shaped curve.
- The plot is linear.

Accepted Answers:

Week 11- Small World Phenomenon

Week 12- Pseudocore (How to go viral on web?)

The plot is a bell shaped curve.

8) Which of the following represents the correct equation for power law? ***1 point***

- $y = \frac{1}{x^2}$
- $y = \frac{1}{x^3}$
- $y = \frac{1}{x^4}$
- All of the above

Accepted Answers:
All of the above

9) Which of the following distributions follow a power law? ***1 point***

- Telephone conversation duration
- Number of song downloaded from a website
- Number of incoming links for nodes in the web graph
- All of the above

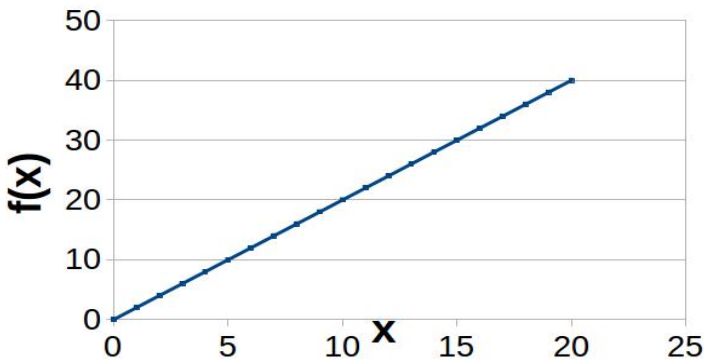
Accepted Answers:
All of the above

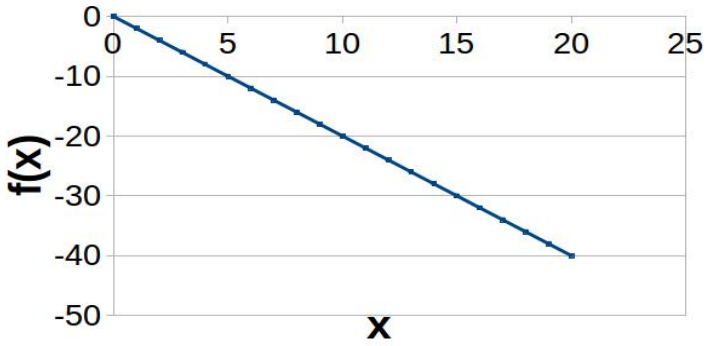
10) Power law degree distribution in real world networks follow the characteristic equation $y = \frac{1}{k^\alpha}$. What is the value of α here? ***1 point***

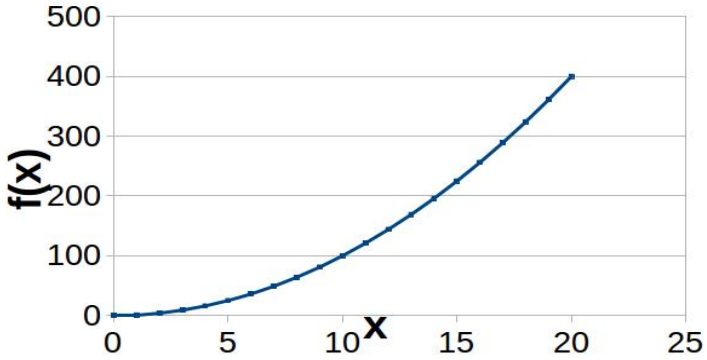
- 1 <α< 2
- 2 <α< 3
- 3 <α< 4
- None of the above

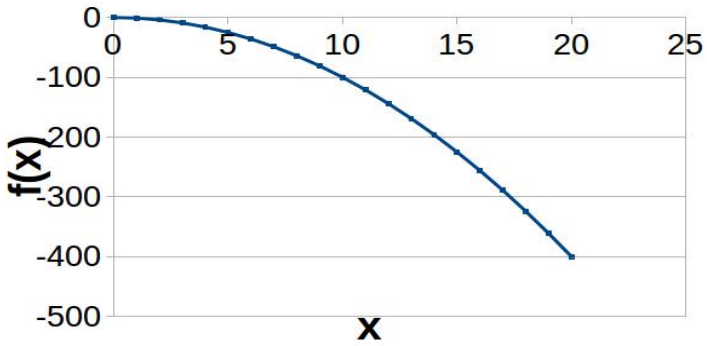
Accepted Answers:
2 <α< 3

11) Consider the equation g (k) = $\frac{1}{k^2}$. Let x = log k and f(x) = log g(k). How does the plot of f(x) look like? ***1 point***

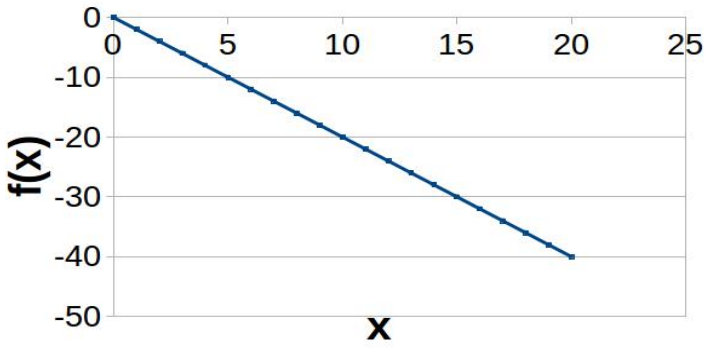








Accepted Answers:



12) How does the power law degree distribution come by in real world networks? ***1 point***

- By preferential attachment
- By random linking
- By uniform edge connection
- No hypothesis is found.

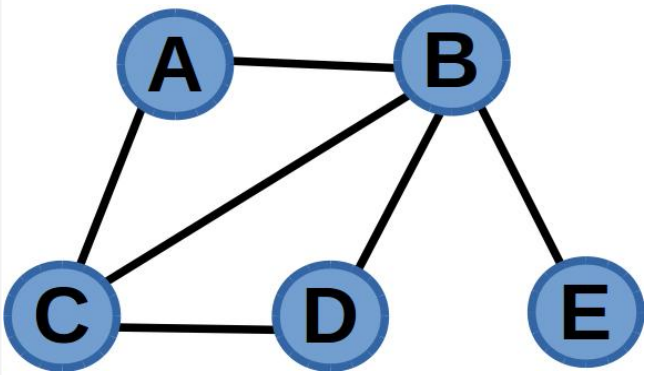
Accepted Answers:
By preferential attachment

13) In the preferential attachment, a new coming node will prefer to make the connection with the node having *1 point*

- fewer friends
- More friends
- Average number of friends
- Average number of friends

Accepted Answers:
More friends

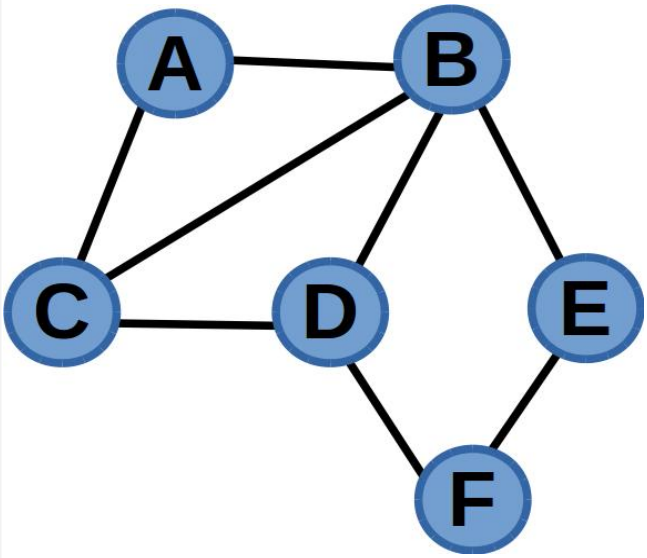
14) Given a network being generated by 'rich get richer' phenomenon. The figure below shows the snapshot of the network at time t. A new node u enters the network at time t + 1 and makes an edge with one of the existing nodes. What is the probability that u will make an edge with C? *1 point*



- 1/2
- 1/5
- 1/3
- 1/4

Accepted Answers:
1/4

15) Given a network being generated by 'rich get richer' phenomenon. The figure below shows the snapshot of thenetwork at time t. A new node u enters the network at time t + 1 and makes an edge with one of the existing nodes. The probability of u making an edge with an existing node w is defined as p(w). Which of the following equations is correct? *1 point*

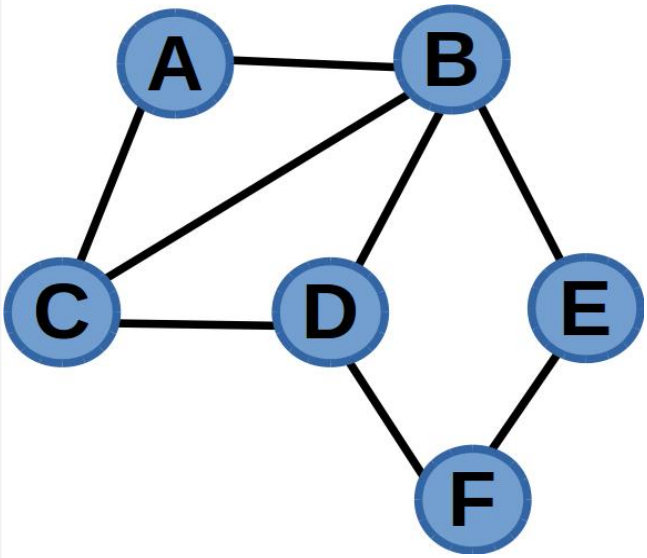


- p(A) < p(C) < p(B)
- p(E) < p(D) < p(B)

- p(F) < p(C) < p(B)
- All of the above

Accepted Answers:
All of the above

16) Given a network being generated by 'rich get richer' phenomenon. The figure below shows the snapshot of thenetwork at time t. A new node u enters the network at time t + 1 and makes an edge with one of the existing nodes.Which of the node it makes a link to? ***1 point***



- A
- B
- C
- Can't say

Accepted Answers:
Can't say

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