* 1. Each node is part of at most triangles. Each triangle forms with probability . Thus, on average, each node is part of triangles. Since each triangle adds two edges for the given node, the expected degree is .
  2. Since we have an integer number of triangles and each triangle adds two edges, we cannot have an odd number of edges so if is odd. If is even, we can express it as .
  3. T

1. We can approximate the in-degree distribution using the power law with . Then .
   1. 30. This is the average in-degree of all nodes. This is equal to the average out-degree of all nodes, which is 30.
   2. Here we can use the closed form solution for the indegree distribution:

.

* 1. Here we can use the CCDF of the power-law approximation:

.

* 1. Suppose we add a new node, . for all existing nodes . The expected number of new edges to degree- nodes is:

After adding the new node, the expected number of degree- nodes is:

Proof by induction:

Suppose

QED.

1. See 3\_4.ipynb
   1. .

* 1. Symmetry is exhibited by 2,3 and by 6,7
     1. 1 -
     2. 2/3 -
     3. 4 -
     4. 5 -
     5. 6/7 -
     6. 8 -



* 1. represents the probability of making a group between groups . To promote assortativity, we want to be large and to be small. Then we can add a constraint that . This ensures that groups will always be more likely to have edges with themselves than with other groups.

* 1. T
  2. T
  3. T
  4. T