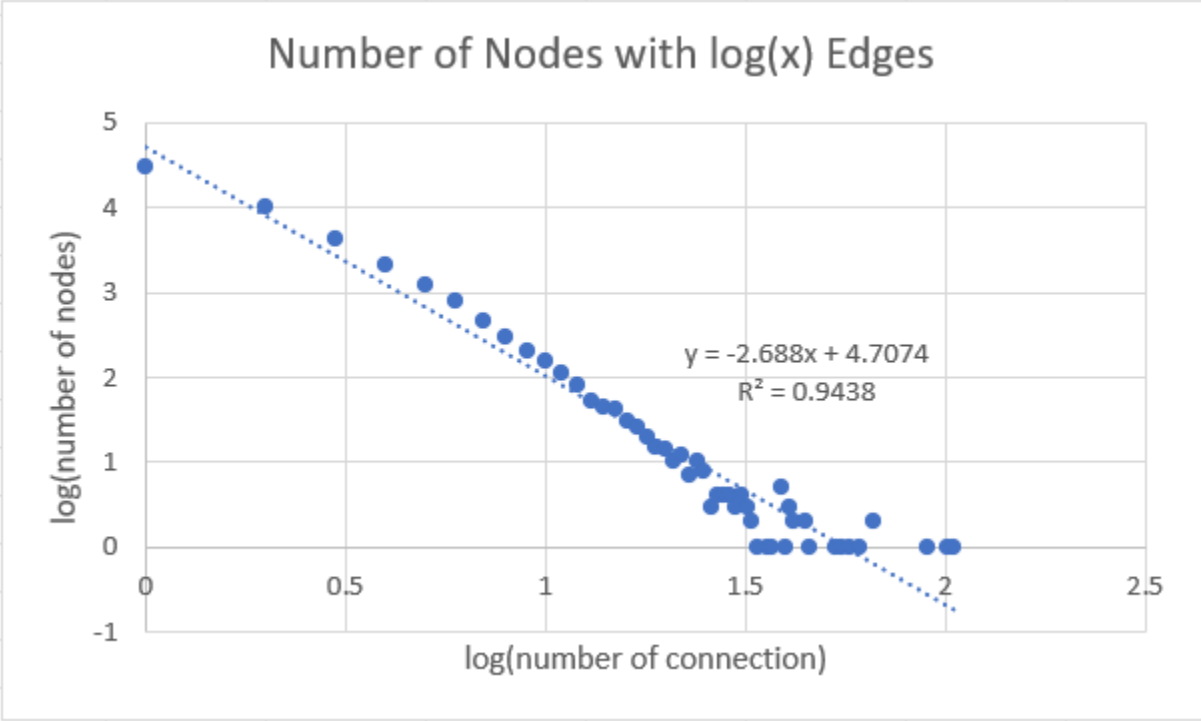
Corey Lundgren and Robby Swenson
MCS-381 Project 1 Report

Introduction:

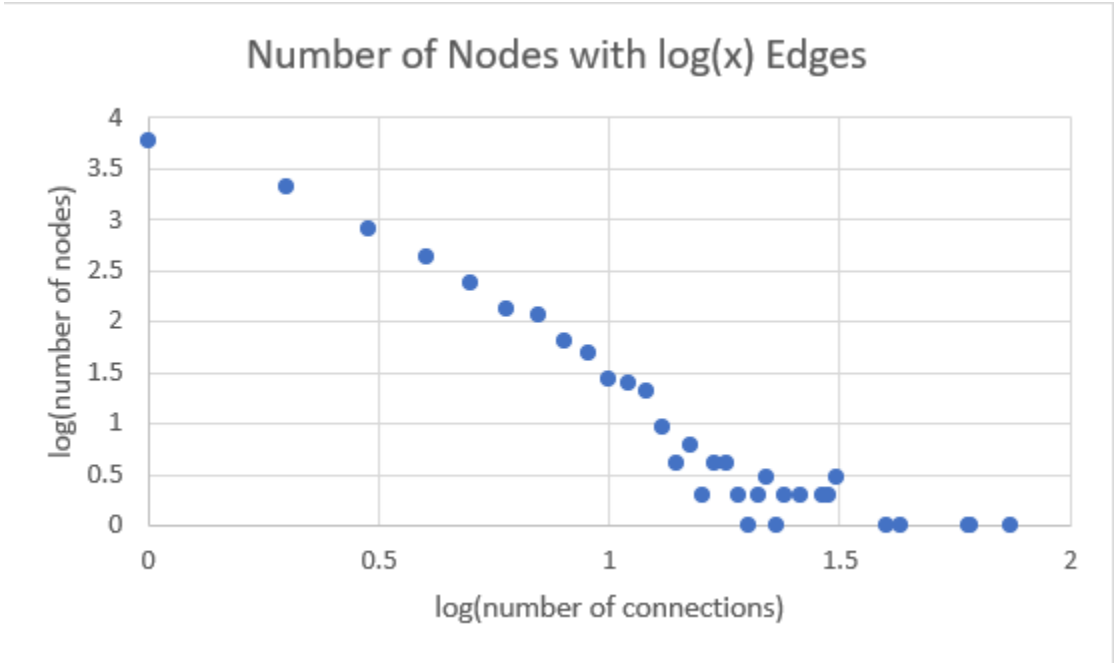
In this project, we built a model in Java which works according to the power law. The power law is the idea that the most connected nodes in a network are more likely to amass new edges, while the less connected nodes are less likely to amass new edges. This results in a network where many nodes have few edges and few nodes have many edges. In our model, we started with a graph of two nodes that connected to each other, and continued to individually add *n* nodes, each with one new connection to a pre-existing node in the network. The probability that a new node would connect to any particular old node increased as the old node had more existing edges. Below are the log-log graphs which detail our simulation results for simulations of *n* = 50,000; *n* = 10,000; and *n* = 5,000.

50,000 Graph:



Justification: **This log-log plot *does* follow the power law**. If our model follows the power law, then nodes with many edges will amass more edges as the simulation occurs, while other nodes will fail to amass edges. This means that there will be few nodes with many connections and many nodes with few connections. This is what happened. **The right side of the graph represents nodes with many connections, and they are low on the y-axis, meaning there are few of these nodes. The left side of the graph represents nodes with few connections, and they are high on the y-axis, meaning there are many of them. The slope of this log-log plot is -2.688.**

10,000 Graph:



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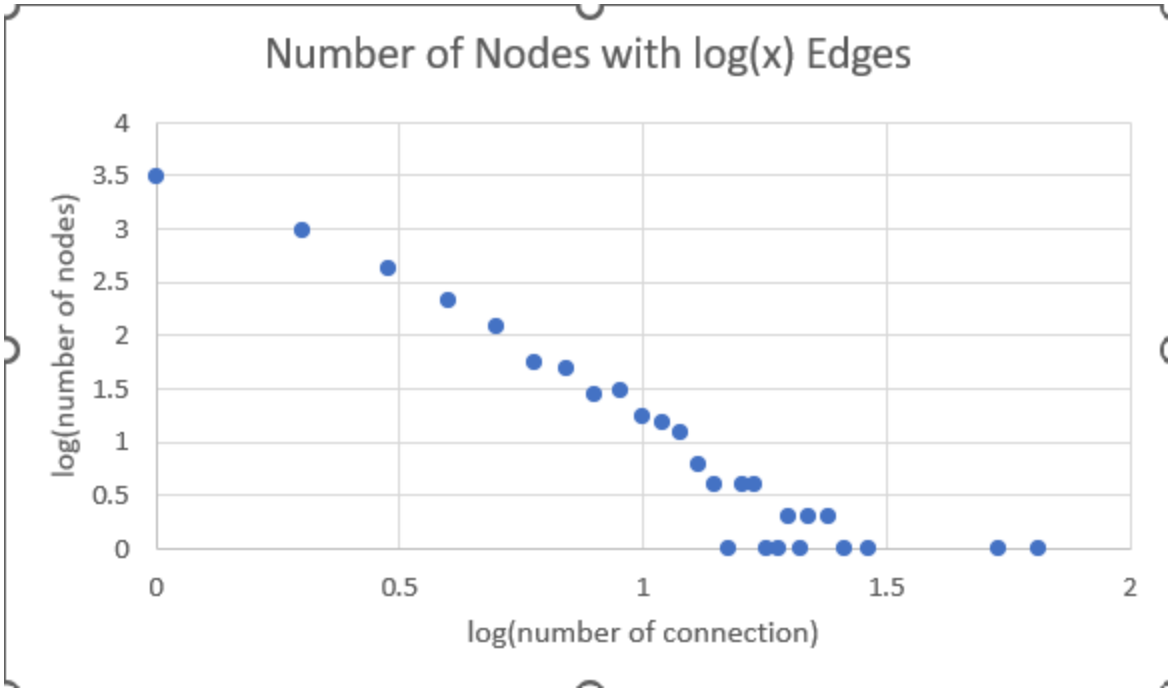
5,000 Graph:



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Conclusion:

In this project, we successfully created a model to simulate a social network forming by following the power law. Our model created log-log graphs with a high R^2 that showed a linear relationship between the log of the degree of a node, and the log of the number of nodes of that degree, with a slope of -2.688 log(nodes) per log(connection).