Report

Part a

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 1 edge | 5 edges | 10 edges | 15 edges | 20 edges |
| mvc\_1 | 1.00 | 1.02 | 1.00 | 1.00 | 1.00 |
| mvc\_2 | 2.58 | 1.68 | 1.33 | 1.19 | 1.11 |
| mvc\_3 | 2.00 | 1.79 | 1.55 | 1.39 | 1.35 |

Table 1. Rounded to 3 significant digits, sum of the lengths of MVCs generated by the approximation algorithms of 100 graphs of 1, 5, 10, 15, and 20 edges, divided by the sum of the lengths of actual MVCs for the same 100 graphs to obtain how many times longer than minimum the approximations were.

The information in Table 1 is also displayed in Graph 2 in the Graphs section. On average, mvc\_1 is 1.01 times the minimum, mvc\_2 is 1.58 times, and mvc\_3 is 1.62 times longer than the minimum. The averages are also displayed in Graph 3.

Part b

As apparent in Graph 2, mvc\_1’s expected performance shows no correlation to the number of edges in a graph, however, mvc\_2 and mvc\_3 both get better as the number of edges increase and the graph gets fuller.

Part c

As apparent in Graph 5, mvc\_1’s expected performance shows no correlation to the number of nodes in a graph, however, mvc\_2 and mvc\_3 both get better as the number of edges decrease and the graph gets fuller (as the number of edges stay the same).

Part d

I used the suggested experiment design in the assignment sheet and ran the 100 trials for 5 iterations with 3,7,11,15, and 19 edges and 20 nodes. Respectively, 12%, 32%, 55%, 84%, and 100% of graphs had cycles. This information is also displayed in Graph 1, which displays the overall average as well.

Graphs

A graph with blue squares

AI-generated content may be incorrect.Graph 1. Generated from experiment\_1A graph with green and orange lines

AI-generated content may be incorrect.Graph 2. Generated from experiment\_2A graph with blue squares

AI-generated content may be incorrect.Graph 3. Generated from experiment\_2A graph with a bar

AI-generated content may be incorrect.Graph 4. Generated from experiment\_2

A graph with green and orange lines

AI-generated content may be incorrect.Graph 5. Generated from experiment\_3A graph with blue squares

AI-generated content may be incorrect.Graph 6. Generated from experiment\_3A blue bar graph with white background

AI-generated content may be incorrect.Graph 7. Generated from experiment\_3