Question - 1

SCORE: **5 points**

Question 1

By induction show that $5^n - 1$ is divisible by 4 for all values of $n \geq 1$

Question - 2

SCORE: **5 points**

Question 2

What is Stirling's approximation for n! in tilde notation?

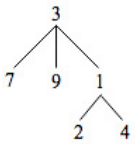
- ~ ln(n)
- ~ lg(n)
- ~ n ln(n)
- ~ n lg(n)

Question - 3

SCORE: **5 points**

Question 3

The operations union(1, 2), union(4, 2), union(3, 7), union(3, 9), union(3, 4) result in the tree:



Which algorithm was used?

- Quick union
- Weighted quick union
- Quick union with path compression
- Weighted quick union with path compression

Question - 4

SCORE: **5 points**

Question 4

What is the final id array if the quick-find algorithm is performed with the sequence union(3, 1), union(4, 2), union(3, 4), union(7, 8), union(9, 0), union(0, 1), union(8, 2)?

- [9, 9, 9, 9, 9, 5, 6, 9, 9, 9]

- [7, 7, 7, 7, 7, 5, 6, 7, 7, 7]
- [2, 2, 2, 2, 2, 5, 6, 2, 2, 2]
- [8, 8, 8, 8, 8, 5, 6, 8, 8, 8]

Question - 5

SCORE: 30 points

Question 5

Your task is to implement the find and union methods for the weighted quick union algorithm