Problem 1:

Since and , we can conclude that is eventually decreasing

Since and , we can conclude that is eventually increasing

Since we can conclude that is increasing

Problem 2:

Problem 3:

Problem 4:

Number of ways 2 of the 5 applicants be ranked first and second:

Problem 5:

Claim:

Base case:

Induction step:

* Suppose

We have which means,

From (1) & (2), we have

In conclusion, the claim is correct.

Problem 7:

Problem 8:

Given and Y doesn’t have any common elements with ,

1. We can obtain Y by adding to every set of .

Problem 9:

1. Given
2. Given

Problem 10:

Thus, is

Thus, is

Thus, is

Thus, is

Thus, is

Thus, is