10/19/2026 Fall 2026, Discrete Structures I Quiz 6 Sitaraman

Howard University Math Department

Instructions:

PLEASE PROVIDE STEP BY STEP EXPLANATIONS

WRITING ONLY ANSWERS WILL NOT GET FULL CREDIT

Time Limit 30 minutes

Please read the questions carefully before answering

1. (a) (9 points) Show that the following is an equivalence relation on the rational numbers :

$$xRy \iff x - y \in \mathbb{Z}.$$

(b) (6 points) Find the equivalence classes of 0 and 1.5.

2. (15 points) Given the sequence $s_n = \frac{1}{n} - \frac{1}{n+1}....., n \geq 1$ answer the following:

(a) Is it increasing, decreasing, nonincreasing or nondecreasing? (could be more than one). NOTE: You MUST prove for the full sequence in general. Not enough to just check the first few terms.

(b) Find $\sum_{n=1}^{4} s_n$

(c) Find the formula for the k-th term of the subsequence $s_2, s_4, s_6, ...$ (with even indices only) considered as a new sequence $a_1, a_2, a_3, ...$

3. (Extra credit) (5 points) Can you see a pattern in the sums of the sequence in problem 2? What would be the sum of the first 100 terms, in other words, what is $\sum_{n=1}^{100} s_n$?