

## Homework 1

Released 1/24/2019

Due ~~2/7/2019~~ 2/8/2019 11:59pm in Gradescope

**Instructions.** You make work in groups, but you must write solutions yourself. List collaborators on your submission.

If you are asked to design an algorithm, please provide: (a) the pseudocode or precise description in words of the algorithm, (b) an explanation of the intuition for the algorithm, (c) a proof of correctness, (d) the running time of your algorithm and (e) justification for your running time analysis.

**Submissions.** Please submit a PDF file. You may submit a scanned handwritten document, but a typed submission is preferred. Please assign pages to questions in Gradescope.

1. (15 points) **Stable Matching Running Time.**

- (a)
- (b)

2. (20 points) **Stable Matchings: K&T Ch 1, Ex 5.**

- (a) **Strong Instability.**
- (b) **Weak Instability.**

3. (15 points) **Big-O.**

- (a)  $f(n) = \frac{1}{2}n^2$ .
- (b)  $f(n) = n(\log n)^3$
- (c)  $f(n) = \sum_{i=0}^{\lceil \log n \rceil} \frac{n}{2^i}$ .
- (d)  $f(n) = \sum_{i=1}^n i^3$ .
- (e)  $f(n) = 2^{(\log n)^2}$

4. (20 points) **Asymptotics. K&T Ch 2, Ex 6.**

- (a)
- (b)
- (c)

5. (10 points) **DFS and BFS. K&T Ch 3, Ex 5.**

6. (20 points) **Butterfly ID. K&T Ch 3 Ex 4.**

7. (0 points). How long did it take you to complete this assignment?