

Nathan Stouffer

September 2, 2019

**CSCI 246 Problem 1-1**

Collaborators: *none*

My photo in D2L has been updated to be a clearly identifiable photo.

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**CSCI 246 Problem 1-2**

Collaborators: *none*

This assignment uses the homework template.

**CSCI 246 Problem 1-3**Collaborators: *none*

- Algorithms: Coded search and sort algorithms in Java and Python
- Data Structures: Coded linked lists, trees, stacks, and queues in Java
- Graphs: Only the knowledge that they consist of nodes and lines
- Binomial Coefficients: No experience
- Proof by Counter-example: Proving simple statements
- Proof by Example: Proving simple statements
- Proof by Induction: No experience
- Recursion in Code: Using recursion in CSCI 127 and CSCI 132
- Recurrence Relations: No experience
- The Four Color Theorem: No experience

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**CSCI 246 Problem 1-4**

Collaborators: *none*

I have reviewed all properties of real numbers in Appendix A.

**CSCI 246 Problem 1-5**Collaborators: *Kevin Browder*

Prove there are distinct integers  $m$  and  $n$  such that  $\frac{1}{m} + \frac{1}{n} \in \mathbb{Z}$

Proof by Example

If  $m = 1$  and  $n = -1$ , then the equation reads  $\frac{1}{1} + \frac{1}{-1} = 0$  where  $m$ ,  $n$ , and the solution are all integers

**CSCI 246 Problem 1-6**Collaborators: *Kevin Browder*

Prove the product of any even integer and any integer is even

Statement: An integer is even if it is divisible by two.

Any given even integer,  $A$ , can be written as  $2 * B$  where  $B = \frac{A}{2}$ . Therefore, the product of  $A$  and any integer,  $C$ , will be even because it is equivalent to  $2 * B * C$ , which is divisible by 2

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**CSCI 246 Problem 1-7**

Collaborators: *Kevin Browder*

Sets A and D are equal

**CSCI 246 Problem 1-8**Collaborators: *Kevin Browder*

The relation  $T$ , defined as  $y^2 - x^2 = 1$ , is not a function because it does not satisfy the following property:

For all elements  $x$  in  $A$  and  $y$  and  $z$  in  $B$ , if  $x, y \in F$  and  $x, z \in F$ , then  $y = z$

Proof by Counter-example

If  $x = 0$ , then  $T$  will be  $y^2 = 1$ . At this point,  $y$  could be defined as 1 or -1 to satisfy the relation, which proves that  $T$  is not a function.



**CSCI 246 Problem 1-9**Collaborators: *none*

Georg Cantor was a German mathematician in the mid 1800s that focused much of his work on the nature of different types of infinities. Regarding computer science, Cantor was one of the pioneers of set theory, which we will deal with a lot on this class. According to the Encyclopedia Britannica, Cantor developed sets of numbers from the integers to irrationals [1]. We use sets in computer science to organize information and draw relations between different data.

## References

- [1] The Editors of Encyclopedia Britannica "Georg Cantor." Encyclopedia Britannica. Encyclopedia Britannica Inc., 2018. Britannica. Web. Sep 4, 2018.