DSC 40B - Discussion 03

Problem 1.

Express the followingfunction's rate of growth using Θ-notation, and prove your answer by finding constants which satisfy the definition of Θ-notation. Make sure to show your work by writing out the chain of inequalities to prove each bound.

$$f(n) = \frac{n^2 + 7n - 8}{n - 5}$$

Problem 2.

Consider the algorithm below.

```
def bogosearch(numbers, target):
    """search by randomly guessing. `numbers` is an array of n numbers"""
    n = len(numbers)

    while True:
        # randomly choose a number between 0 and n-1 in constant time
        guess = np.random.randint(n)
        if numbers[guess] == target:
            return guess
```

We will set up the analysis of the expected time complexity of this algorithm.

a) What are the cases? How many are there?

b) What is the probability of case α?

c) What is the running time in case α?

Problem 3.

Provide a tight theoretical lower bound for the problems given below. Provide justification for your answer.

a) Given an array of n numbers, find the sum of the numbers in the array.

b) Given a sorted array of $n \geq 2$ numbers, find the second largest number in the array.