QUIZ 2

CS 198-087: INTRODUCTION TO MATHEMATICAL THINKING
UC BERKELEY EECS
SPRING 2019

You will have 30 minutes to work on the quiz. Please fit all of your answers in the space provided. You are not allowed to consult any notes or use any electronics.

Total points: 20

Name:

SID:

@berkeley.edu email:

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1. **Pythagorean Triplets** *(Points: 5)*

   Prove that if $a^2 + b^2 = c^2$ for natural numbers a, b, c, then at least one of a, b, c must be even.

2. **Basic Induction** *(Points: 5)*

   For every natural number n, prove that $3|(2^{2n} - 1)$. *(Hint: Use induction.)*

3. **Triangle Inequality** *(Points: 10, 5 each)*

    a. Prove the triangle inequality
$$|a_1 + a_2| \leq |a_1| + |a_2|$$
for any two real numbers a_1, a_2. *(Hint: Consider four possible cases.)*

    b. Use induction to prove

$$|a_1 + a_2 + \cdots + a_n| \leq |a_1| + |a_2| + \cdots + |a_n| \tag{1}$$

holds true for any n. *(Hint: In your induction step, you will need to use the result from part a.)*