MATH 108, **Midterm**, February 13, 2019

NAME:

No notes or calculators are allowed. Show all your work.

1. Let a be a positive integer and let P be the conditional statement: "If a is not divisible by 3, then $5a$ is not divisible by 3."

   (a) Write the contrapositive of P. [/2]

   (b) Prove P by contraposition. [/4]

problem	1	2	3	4	5	total
points						
maximum	6	5	5	5	4	25

2. Prove using induction that for all postive integers n,

$$\sum_{k=1}^{n}(2k-1) = n^2.$$

[/5]

3. For sets A, B, C, prove that [/5]

$$(A \cap C) \setminus B \subseteq (A \cup B) \cap C.$$

4. Let $\sim$ be the relation on $\mathbb{Z}$ defined by $x \sim y$ if and only if $x + 1 = y$. Which of the following properties does $\sim$ have: symmetric, antisymmetric, transitive, reflexive, irreflexive? [/5]

5. Find the last digit of 4^{200}. [/4]