



**YOGYAKARTA STATE UNIVERSITY**  
**FACULTY OF MATHEMATICS AND NATURAL SCIENCES**

**FINAL EXAMINATION OF THE SECOND SEMESTER 2011/2012**

Course Name	: Number Theory	Instructor	: Kus Prihantoso K., M.Si.
Code	: MAA 209	Date	: Wednesday, June 20 <sup>th</sup> , 2012
Department	: Dept. of Math. Edu.	Exam Hour	: 07.30 - 09.10
Semester	: II	Room	: D07.310

1. Use Mathematical induction to show that if  $n > 1$  then (**Max score: 25**)

$$\binom{2}{2} + \binom{3}{2} + \binom{4}{2} + \dots + \binom{n}{2} = \binom{n+1}{3}$$

2. Prove that no integer in the following sequence is a perfect square: (**Max score: 25**)

$$11, 111, 1111, 11111, \dots$$

[*Hint*: A typical term  $111 \dots 111$  can be written as  $111 \dots 111 = 111 \dots 108 + 3 = 4k + 3$ .]

3. Determine all solutions in the positive integers of the Diophantine equation

$$158x - 57y = 7.$$

(**Max score: 25**)

4. Show that the only prime  $p$  for which  $3p + 1$  is a perfect square is  $p = 5$ .

(**Max score: 25**)

**Academic dishonesty will not be tolerated.**

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Kus Prihantoso	Faculty of Mathematics and Natural Sciences of YSU	.....