



Suan Sunandha Rajabhat University
Faculty of Education, Branch of Mathematics
Final Examination, Semester 2/2016

ID Subject MAT1202	Course Name Set Theory	Test Time 9am - 12am Wed 3 May 2017	Full Scores 105 points 30%
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Name..... **ID**..... **Section**.....

Direction

1. 10 questions and 10 pages.
2. Write obviously your name, id and section all pages.
3. Without calculators and communication tools.
4. Don't take text books and others come to the test room.
5. Cannot answer sheets out of test room.
6. Deliver to the staff if you make a mistake in the test room.

Signature

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Lecturer: Thanatyod Jampawai, Ph.D.

	1	2	3	4	5	6	7	8	9	10	

1. (10 points) Explain your answers.

1.1 Describe the **method of proof** that $A \sim B$.

1.2 Is equivalent sets (\sim) **equivalent relation** ? Give me reasons and verify your answer.

1.3 Give the example of distinct sets A and B satisfying

if $A \cup B$ is denumerable, then A or B are finite.

1.4 Can you define **sum** of $(\{1, 2, 3\}, \leq)$ and $(\{\emptyset, \{1\}, \{2\}\}, \subseteq)$? Give a reason(s).

1.5 Let a, b and c be cardinal numbers. Give an **counter example** for the following statement.

if $a \cdot b = a \cdot c$, then $b = c$.

2. (15 point) Explain your answers

2.1 (5 points) Let A, B and C be sets. Prove that

if $A \sim B$ and $B \sim C$, then $A \sim C$.

2.2 (5 points) Suppose that $f : (0, 1) \rightarrow A$ is **bijective** and defined by $f(x) = 2x + 1$.
Show that $A \sim (-1, 1)$.

2.3 (5 points) Show that $(0, 1) \sim (0, a)$ for all $a > 0$.

3. (10 points) Explain your answers

3.1 (3 points) Let A and B be two sets. Suppose that A is finite and $A \sim B$. Define

$$S = \{f : A \rightarrow B : f \text{ is bijective} \}$$

If $n(S) = 120$, find $n(A)$.

3.2 (7 points) Show that $A = \{7k + 1 : k \in \mathbb{Z}\}$ is infinite.

4. (10 points) Show that $A = \{x^2 - 1 : x \in \mathbb{Z}\}$ is denumerable.

5. (10 points) Explain your answers

5.1 (5 points) Give the example of distinct sets A and B satisfying

$$C \subset A - B \text{ and } \#(A) = \#(B) = \#(C).$$

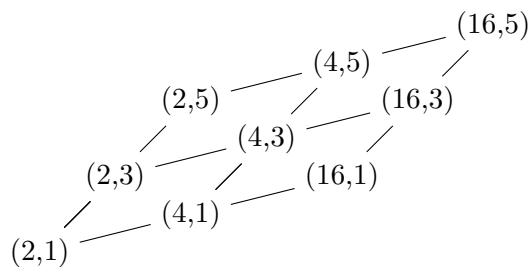
5.2 (5 points) Find cardinal number of

$$A = \left\{ x : x = \left(a + \frac{1}{|a|} \right)^2 - \left(a - \frac{1}{|a|} \right)^2 \text{ where } a \in \mathbb{Z} \text{ and } a \neq 0 \right\}$$

6. (10 points) Let a and b be cardinal numbers. Prove that

$$a \cdot b = 1 \text{ if and only if } a = 1 \text{ and } b = 1.$$

7. (10 points) Let $a \cdot b$ be a product of ordinal numbers shown by



Draw digram of $a + b$ and describe relation for each ordinal number.

8. (10 points) Let \otimes be a binary operation on \mathbb{N} defined by

$$\begin{aligned}m \otimes 0 &= S(S(m) + 1) \\m \otimes S(n) &= m \otimes n\end{aligned}$$

where $S(n)$ is a successor of n . Compute

8.1 (5 points) $2016 \otimes 2560$

8.2 (5 points) $(1 \otimes a) + (2 \otimes a) + (3 \otimes a) + \cdots + (100 \otimes a)$ where $a \in \mathbb{N}$.

9. (10 point) Let m and n be natural numbers. Prove that

$$m \cdot n > 0 \quad \text{if and only if} \quad m > 0 \text{ and } n > 0.$$

10. Explain your answers

10.1 (**5 points**) If your student does not understand why the **size** of set of **positive even numbers** equals to the size of set of **natural numbers**. How to easily explain the question.

10.2 (**5 points**) Review about SET THEORY subject in your opinion (Don't over claim).