Suan Sunandha Rajabhat University
Faculty of Education, Division of Mathematics
Midterm Examination, Semester 2/2019

ID Subject	Course Name	Test Time	Full Scores
MAP2406	Mathematical Analysis	5pm - 8pm Thur 5 Mar 2020	105 points 30%

Name..... **ID**..... **Section**.....

Direction

1. 10 questions and one Extra of all 12 pages.
2. Write obviously your name, id and section all pages.
3. Don't take text books and others come to the test room.
4. Cannot answer sheets out of test room.
5. Deliver to the staff if you make a mistake in the test room.

Your signature

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Lecturer: Assistant Professor Thanatyod Jampawai, Ph.D.

No.	1	2	3	4	5	6	7	8	9	10	Extra
Scores											

Total

1. **(10 points)** Let a and b be a non-negative real numbers. Prove that

$$\sqrt{ab} \leq a + b.$$

2. **(10 points)** Let x and y be real numbers. Prove that

$$|x+y| = |x| + |y| \quad \text{if and only if} \quad xy \geq 0.$$

3. **(10 points)** Define the set

$$A = \left\{ \frac{n^2}{n^2+1} : n \in \mathbb{N} \right\}.$$

Find $\boldsymbol{\sup A}$ and $\boldsymbol{\inf A}$ with proving them.

4. **(10 points)** Use Definition to prove that

$$\lim_{n\to\infty} \frac{n}{\sqrt{n^2+1}} = 1.$$

5. **(10 points)** Assume that $x_n \to -2$ as $n \to \infty$. Show that

$$\frac{1}{1+(x_n)^2} \to \frac{1}{5} \quad \text{as} \quad n \to \infty.$$

6. **(10 points)** Let $\{x_n\}$ be a sequence in $\mathbb{R}$. Prove that

$\{x_n\}$ is a Caucy sequence if and oly if $\{x_n\}$ is a convergent sequence.

7. **(10 points)** Let A be a nonempty subset of $\mathbb{R}$. Assume that A is open. Prove that

$$\inf A \notin A \quad \text{and} \quad \sup A \notin A.$$

8. **(10 points)** Use definition to prove that

$$\lim_{x \to -1} \frac{x}{x+2} = -1.$$

9. **(10 points)** Use definition to prove that

$$\lim_{x\to 2^-} \frac{1}{\sqrt{2-x}} = +\infty.$$

10. **(10 points)** Let f and g be real functions from a set E to $\mathbb{R}$. Assume that

$$f(x) \leq g(x) \quad \text{for all } x \in E.$$

Let a is a limit point of E. Prove that if $f(x) \to \infty$ as $x \to a$, then

$$g(x) \to \infty \text{ as } x \to a.$$

Extra (5 points) Let X' represent the **set of all limit points** of X.
Let A and B be two subset of $\mathbb{R}$. Show that

$$(A \cup B)' = A' \cup B'.$$