

Name and ID: \_\_\_\_\_

1. Introduction to Dr.Jing's VV156

**Question1** (1 point)

Write down the recommended strategy for you to perform well in VV156. (Simply writing the recommended reference books is OK)

**Solution:**

To well preview the course and get more familiar with the related terminology in English version, <Calculus> is the best choice. You are strongly recommended to go through the TF Qs on it.

To get more familiar with the related strategies which will be applied in this course, <Tong Ji Gao Shu> is well recommended for all of you to enjoy the life of sinking into the practice problems.

However, you are strongly recommended to ask Prof.Jing during the break and at his OH, and TAs at their OH to have a more clear understanding of the stuffs from the details of the simple definition to the overall understanding of the system of the course.

Play hard and work hard in JI, please!

**Question2** (1 point)

What does an elegant proof look like?

**Solution:**

A proof is a series of statements, each of which follows logically from what has gone before. It starts with things we are assuming to be true. It ends with the thing we are trying to prove.

So, like a good story, a proof has a beginning, a middle and an end.

- (a) **Beginning:** things we are assuming to be true, including the definitions of the things we're talking about.
- (b) **Middle:** statements, each following logically from the stuff before it.
- (c) **End:** the thing we're trying to prove.

**Question3** (1 point)

Write down the expected format for **Mathematical Induction**.

**Solution:**

**Beginning** Principle of induction

**Middle**

- (a) for  $n=1$ ,  $\dots$  is valid
- (b) Assume for  $n=k$ ,  $\dots$  is valid, then we have  $\dots$

**End** by the Principle of Induction, the result is true for all  $n \in \mathbb{N}$

**Question4** (1 point)

Write down the expected format for the method of **Reduction to Absurdity**.

**Solution:**

- (a) **Beginning:**  
Proof by contradiction (To prove statement P is true)
- (b) **Middle:**  
Assume/ Suppose  $\neg P$  is valid/true, then we have  $\dots$ .  
which negates  $\dots$  <Find a contradiction here>.  
(After reaching the contradiction, we often write a big # here to draw attention to it.)
- (c) **End:**  
The statement P is true/valid.

**Question5** (1 point)

Write down the expected format for proving **the Sufficient and Necessary Condition** (The most common key word here: if and only if).

**Solution:**

- (a) **Beginning:**  
To prove the **Sufficient and Necessary Condition**. (To prove statement  $A \Leftrightarrow$  statement B)
- (b) **Middle:**
  - (1) Prove  $A \Rightarrow B$ .
  - (2) Prove  $B \Rightarrow A$ .
- (c) **End:**  
The statement A and B is equivalent.

**Question6** (0 points)

Keep in mind the general rules for justifying your answering steps.

**Solution:**

- (a) You need to justify everything enough for your peers to understand it.
- (b) If in doubt, justify things more rather than less.

2. Appendix (To make your answer more clean and concise).

**Question1** (0 points)

Illustrate the popular abbreviation for mathematically answering the questions.

**Solution:**

- (a) w.l.o.g= WLOG= Without Loss of Generality.
- (b) iff= if and only if
- (c) w.r.t.= With Respect To
- (d) LHS/RHS
- (e) intuitively