MATH 421

The Theory of Single Variable Calculus

Introductions – Me

Instructor: Grace Work

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Drop-in Hours:

- Wednesday: 12:00-1:00 pm (**VV 311**)
- Thursday: 9:00-11:00 am (**VV B205**) — collaboration
- By appointment & open door

Introductions – Course

This class requires…

- Active learning

- Mindful preparation – reading quiz

- **Goals** – transitioning from *computational* to *theoretical*

- **Logistics** – See syllabus on Canvas

Introductions – You!

Form groups of 4-6 and introduce yourselves!

- Name/pronouns
- Year/major
- A fact about yourself – can be as “fun” or as “boring” as you like. Suggestions:
  - Favorite hobby.
  - What you most recently ate.
  - Where you were born.

Setting the Stage

For each of the questions that follow, I will ask you to:

1. **THINK** about a possible answer on your own.
2. **DISCUSS** your answers with the rest of your group.
3. **SHARE** key points from your group's discussion to Padlet.

Discussion Questions

1. How does one learn a new skill?
2. What is the value of making mistakes in the learning process?
3. How do we create a classroom environment where risk taking is encouraged and productive failure is valued?

Chapter 0: Foundations

Once Upon a Time...

Conjecture (Fermat, 1637): *There are no positive integers a, b, c that satisfy*

$$a^n + b^n = c^n$$

for any integer value of n greater than 2.

Timeline to Proof

proved for n = 3, 5, 7

1637-1839

1847-1993

- faulty proofs
- computers verified n < 4,000,000

Andrew Wiles proposed a proof

June
1993

Aug
1993

error

corrected

Sept
1994

May
1995

proof accepted

Types of Mathematical Statements

Assumed true without proof

Axioms

No proof yet known

Conjecture

Proof required to show true

Theorem

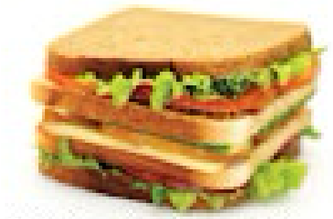
Lemma

Proposition

Corollary

Definitions

Activity: Is it a sandwich?

A 
Triple-decker club

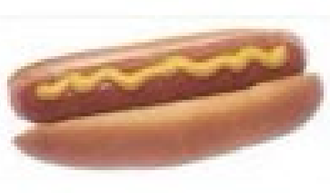
B 
BLT

C 
Submarine

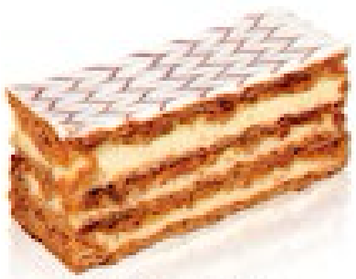
D 
Chicken wrap

E 
Lasagna

F 
French-fry butty

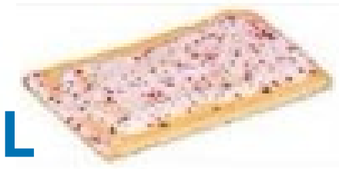
G 
Hot dog

H 
Beef and bean burrito

I 
Napoleon tart

J 
Ice-cream waffle

K 
Frosted sugar cookie

L 
Toaster pastry

Define a sandwich

1. **ON YOUR OWN –** based on the food items you identified as a sandwich, complete the following sentence:

A food item is a sandwich if...

2. **FIND A PARTNER –** once everyone has created their own definition of a sandwich, find someone who has a different list of food items than you and tell them why they are **wrong** and you are **right**.

Definitions

Definition: A ***definition*** is an agreement about the meaning of a particular (mathematical) word.

Q: What agreements would we have to make in order to formulate a definition for a sandwich?