View By: Groups | Groups: 1219-MATH.135.019.1.LEC | Apply

MQ4 (Mon Sep 20) Class Statistics

Number of submitted grades: 55 / 57

Minimum: 80 %

Maximum: 100 %

Average: 95.52 %

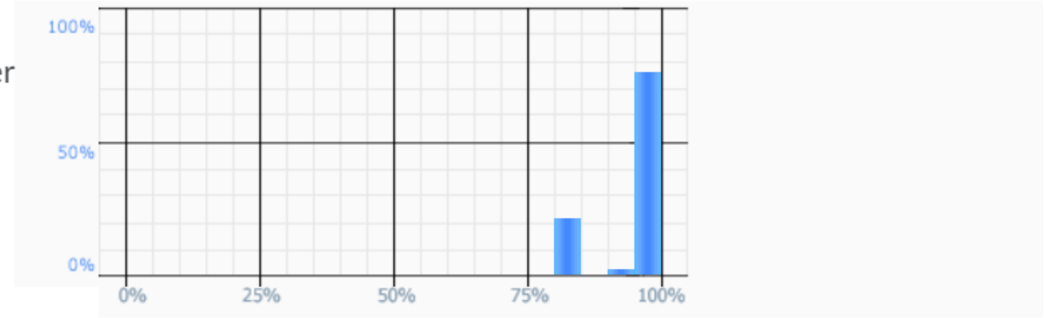
Mode: 100 %

Median: 100 %

Standard Deviation: 8.24 %

Grade Distribution

Number of Users (%)



View By: Groups | Groups: 1219-MATH.135.016.1.LEC | Apply

MQ4 (Mon Sep 20) Class Statistics

Number of submitted grades: 47 / 51

Minimum: 80 %

Maximum: 100 %

Average: 97.3 %

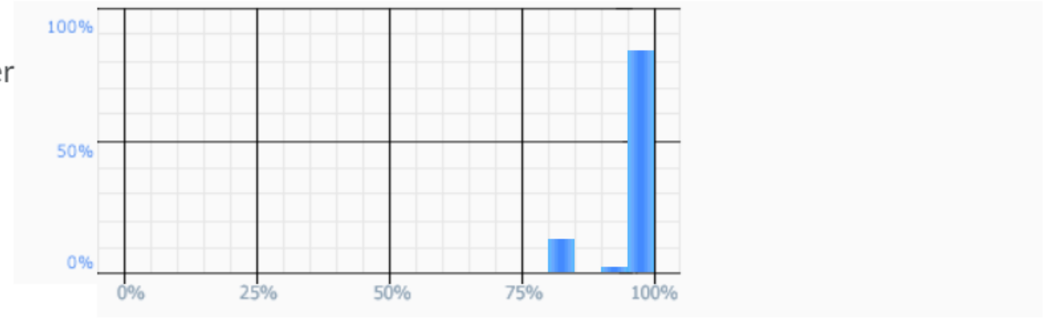
Mode: 100 %

Median: 100 %

Standard Deviation: 6.69 %

Grade Distribution

Number of Users (%)



- You should be done reading up to Chapter 3.6 of the course notes. **Pages 35-57.**

- **Wednesday 22 September:**
  - **Complete Written Assignment 2: WA2**
- Wednesday 22 September:
  - Mobius Quiz 5
- Wednesday 22 September:
  - **Look at your WA01 results thoroughly! Where did you lose marks?**
- Thursday 23 September:
  - WA02 solutions will be posted, hopefully before 12pm: Check the solutions in detail!
- Friday 24 September before class:
  - Mobius Quiz 6
- Sunday 26 September:
  - Complete reading up to the end of Section 0.3 (Polynomials)
- Monday 27 September:
  - Mobius Quiz 7
- Tuesday 28 September:
  - Complete reading from Chapter 3.6 up to 4.4 of the course notes. **Pages 55-75.**

View By: Groups | Groups: 1219-MATH.135.019.1.LEC | Apply

MQ4 (Mon Sep 20) Class Statistics

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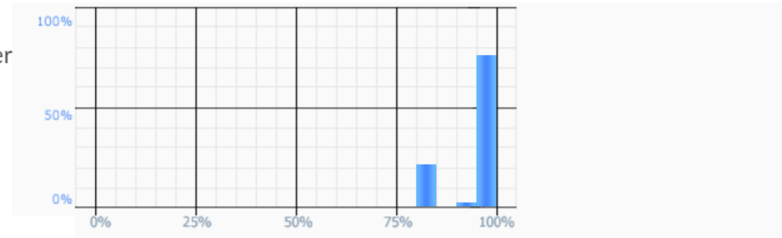
Grade Distribution

Number of Users (%)



View By: Groups | Groups: 1219-MATH.135.016.1.LEC | Apply

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Grade Distribution

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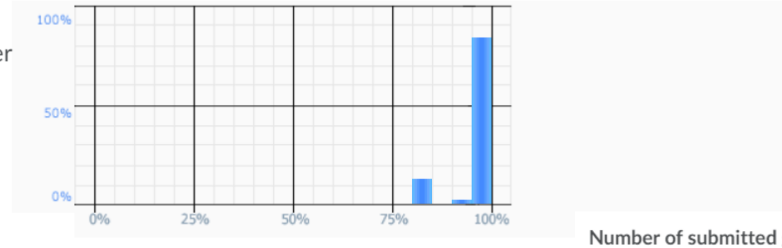


Number of submitted grades: 1,185 / 1,266

Minimum: 0 %

Maximum: 100 %

Average: 95.93 %

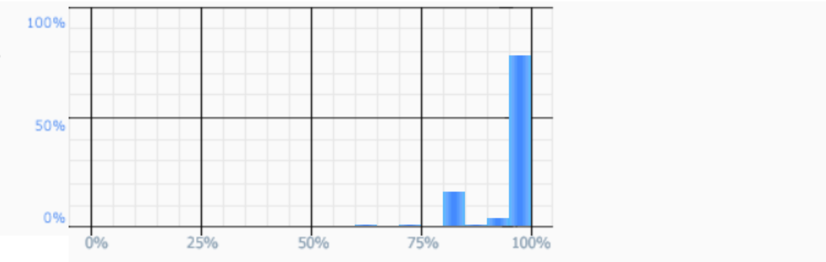
Mode: 100 %

Median: 100 %

Standard Deviation: 8.58 %

Grade Distribution

Number of Users (%)



Office hours: Mondays and Wednesdsays 5-6pm.

MC 4059

Also: online tutorial center

MATH 135: Lecture 7

Dr. Nike Dattani

22 September 2021

Quick Review

If A then B.	(A => B)
A if B.	(B => A)

“Iff” is short for what?

If A then B ***and*** only if B

If A then B ***and*** only if B then A

Don’t consider <u>**iff**</u> to be an English term

Mathematically: A => B and B=> A (A <=> B)

- A iff B
- A exactly when B
- A just if B
- A precisely when B
- A is true whenever B is true
- A is equivalent to B
- A is materially equivalent to B
- A is logically equivalent to B
- A exactly in case B
- A just in case B
- A XNOR B
- A is necessary and sufficient for B

$$A \iff B$$

If and only if

From Wikipedia, the free encyclopedia

In writing, phrases commonly used as alternatives to P "if and only if" Q include: *Q is necessary and sufficient for P*, *P is equivalent (or materially equivalent) to Q* (compare with material implication), *P precisely if Q*, *P precisely (or exactly) when Q*, *P exactly in case Q*, and *P just in case Q*.[3] Some authors regard "iff" as unsuitable in formal writing;[4] others consider it a "borderline case" and tolerate its use.[5]

- A iff B
- A exactly when B
- A just if B
- A precisely when B
- A is true whenever B is true
- A is equivalent to B
- A is materially equivalent to B
- A is logically equivalent to B
- A exactly in case B
- A just in case B
- A XNOR B
- **A is necessary and sufficient for B: A necessary for B (B => A), A sufficent for B (A => B)**

$$A \iff B$$

If and only if

From Wikipedia, the free encyclopedia

In writing, phrases commonly used as alternatives to P "if and only if" Q include: *Q is necessary and sufficient for P*, *P is equivalent (or materially equivalent) to Q* (compare with material implication), *P precisely if Q*, *P precisely (or exactly) when Q*, *P exactly in case Q*, and *P just in case Q*.[3] Some authors regard "iff" as unsuitable in formal writing;[4] others consider it a "borderline case" and tolerate its use.[5]

- Converse
- Contrapositive
- Counter-example
- Contradiction

- Converse
- Contrapositive
- Counter-example
- Contradiction: $(A \wedge \neg A)$ is true

- Converse
- Contrapositive
- Counter-example
- Contradiction
- Corollary
- Conclusion
- Combinations

View By: Groups Groups: MATH135_1219_LEC Apply

WA1 Class Statistics

Number of submitted grades: 1,235 / 1,249

Minimum: 0 %

Maximum: 100 %

Average: 80.38 %

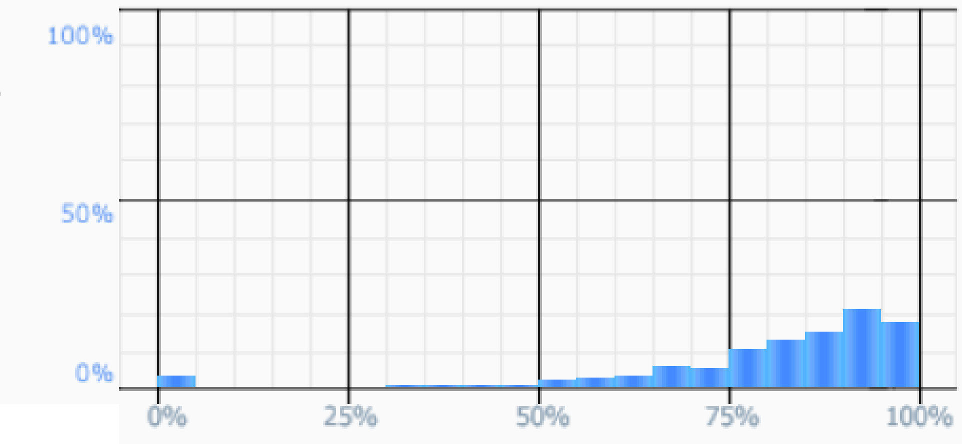
Mode: 94.44 %

Median: 86.11 %

Standard Deviation: 20.73 %

Grade Distribution

Number of Users (%)



View By: Groups Groups: 1219-MATH.135.019.1.LEC Apply

WA1 Class Statistics

Number of submitted grades: 56 / 57

Minimum: 0 %

Maximum: 100 %

Average: 82.79 %

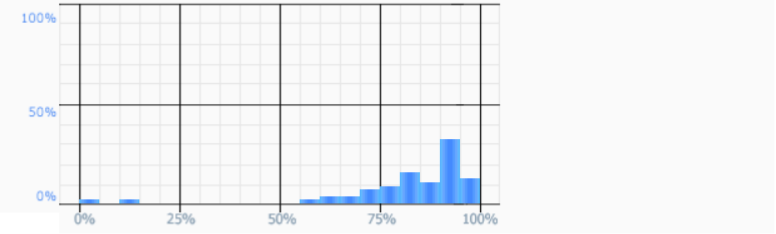
Mode: 94.44 %

Median: 88.19 %

Standard Deviation: 18.01 %

Grade Distribution

Number of Users (%)



View By: Groups Groups: 1219-MATH.135.016.1.LEC Apply

WA1 Class Statistics

Number of submitted grades: 51 / 51

Minimum: 0 %

Maximum: 100 %

Average: 78.79 %

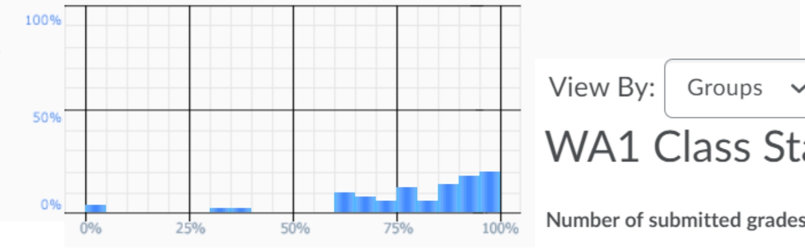
Mode: 94.44 %

Median: 86.11 %

Standard Deviation: 21.97 %

Grade Distribution

Number of Users (%)



View By: Groups Groups: MATH135_1219_LEC Apply

WA1 Class Statistics

Number of submitted grades: 1,235 / 1,249

Minimum: 0 %

Maximum: 100 %

Average: 80.38 %

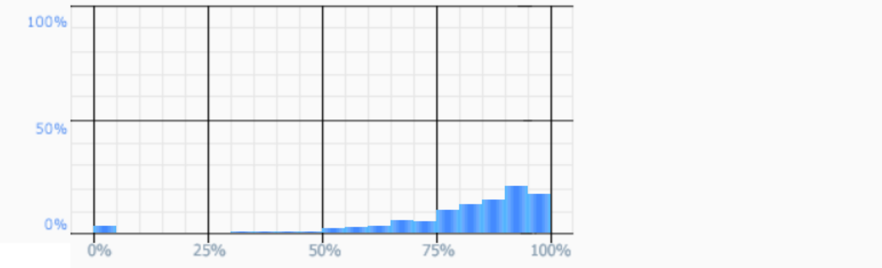
Mode: 94.44 %

Median: 86.11 %

Standard Deviation: 20.73 %

Grade Distribution

Number of Users (%)



For any real numbers $x, y \in \mathbb{R}$, $x^4 + x^2y + y^2 \geq 5x^2y - 3y^2$.

Proof: Let x and y be any real number. Then

$$\begin{aligned} LHS &= x^4 - 4x^2y + 4y^2 + 5x^2y - 3y^2 \quad \text{(Add and subtract } 5x^2y - 3y^2\text{)} \\ &= (x^2 - 2y)^2 + 5x^2y - 3y^2 \\ &\geq 5x^2y - 3y^2 \\ &= RHS. \end{aligned}$$

The following is not a valid proof:

$$\begin{aligned} x^4 + x^2y + y^2 &\geq 5x^2y - 3y^2 \\ x^4 - 4x^2y + 4y^2 &\geq 0 \\ (x^2 - 2y)^2 &\geq 0. \quad \checkmark \end{aligned}$$

In a proof, every line needs to be justified. The first line in the above "proof" is not justified.

Irrationality of $\sqrt{2}$

Prove that $\sqrt{2}$ is irrational.

Proof: Suppose for a contradiction that there exists positive integers p and q such that $\sqrt{2} = p/q$. By replacing p and q by $p/2$ and $q/2$ if both p and q are even, we may assume without loss of generality that at least one of p or q is odd. Squaring both sides gives $p^2 = 2q^2$. Hence p^2 is even, which implies that p is even. Then $p = 2k$ for some integer k. Substituting $p = 2k$ gives $2k^2 = q^2$ which implies that q^2, and thus q, is even. Hence both p and q are even. Contradiction.

Here is another, very slick, proof. Suppose for a contradiction that $\sqrt{2}$ is rational. Let k be the smallest positive integer such that $k\sqrt{2}$ is an integer. Then

$$(k\sqrt{2} - k)\sqrt{2} = 2k - k\sqrt{2} \in \mathbb{Z}.$$

However, $k\sqrt{2} - k$ is a positive integer smaller than k since $\sqrt{2} - 1 < 1$. Contradiction.