Mathematical Verification Protocol: Instructions for Rigorous Review

Table of contents

1 VERIFICATION PROTOCOL

You are tasked with mathematically verifying statements in a technical document. Follow these instructions **exactly** and **completely**. Failure to follow any step constitutes verification failure.

2 FORBIDDEN ACTIONS

The following are **STRICTLY PROHIBITED** during verification:

1. **NO INTUITION**: Do not use phrases like "this seems," "I think," "appears to be," "looks like," or "feels wrong"

2. **NO APPEALS TO AUTHORITY**: Do not reference "standard theory," "well-known results," or "familiar methods" without explicit computation

3. **NO ASSUMPTIONS**: Do not assume anything is "stronger than necessary," "weaker than required," or "different from expected"

4. **NO DISMISSAL WITHOUT PROOF**: Do not mark any statement as incorrect without providing explicit mathematical counter-proof

5. **NO PATTERN MATCHING**: Do not reject statements because they differ from "similar" results you may know

6. **NO MIDDLE GROUND**: Every distinguishable mathematical statement must receive exactly one mark

3 REQUIRED VERIFICATION STEPS

For each mathematical statement, you **MUST**:

3.1 Step 1: Explicit Computation

- Write out all mathematical steps explicitly
- Show all algebraic manipulations
- Verify all claimed equalities by direct computation
- Check all claimed implications by logical deduction

3.2 Step 2: Proof Structure Analysis

For each theorem/proposition:

- Identify the logical structure (if-then, if-and-only-if, etc.)
- Verify each direction of equivalences separately
- Check that all proof steps are mathematically valid
- Ensure no logical gaps exist in the argument

3.3 Step 3: Condition Verification

For each claimed condition:

- Compute what the condition actually requires

- Verify necessity by showing what happens when condition fails
- Verify sufficiency by showing condition implies desired result
- Do not assume conditions are "too strong" or "too weak" without proof

3.4 Step 4: Formula Verification

For each formula or equation:

- Substitute definitions and work through algebra
- Verify dimensional consistency
- Check boundary cases and limiting behavior
- Ensure all integrals/sums are well-defined under stated conditions

4 MANDATORY MARKING SYSTEM

ABSOLUTE REQUIREMENT: Every distinguishable mathematical statement, definition, theorem, proposition, lemma, corollary, formula, equation, or claim must receive **exactly one** of the following marks:

4.1 GREEN CHECK <#2705>: Statement is Mathematically Correct

Mark GREEN CHECK if and only if:

- You have completed explicit mathematical verification
- All computational steps check out
- The logical structure is sound
- No mathematical errors are found
- The statement is mathematically true

4.2 RED X <#274C>: Statement is Mathematically Incorrect

Mark RED X if and only if:

- You have found a specific mathematical error

- You can provide an explicit counterexample
- You can show a logical contradiction
- You have rigorous proof that the statement is false

CRITICAL RULE: You may **ONLY** mark RED X if you provide explicit mathematical proof of incorrectness.

4.3 <#1F7E1> YELLOW CIRCLE: Indeterminate Due to Verification Failure

Mark YELLOW CIRCLE if and only if **ALL** of the following conditions hold:

- You genuinely cannot complete the mathematical verification
- You do not understand the mathematical content sufficiently
- You cannot determine whether the statement is true or false
- You have made genuine effort to understand but failed

YELLOW REQUIREMENTS: If you mark YELLOW it must be because you fail to understand" and this is the only state allowed besides GREEN or RED

YELLOW PROHIBITION: You **CANNOT** mark YELLOW if:

- You think the statement might be wrong (use RED X with proof instead)
- You are unsure but lean toward incorrect (use RED X with proof instead)
- You find the statement unexpected (complete verification instead)
- You lack familiarity with the topic (complete verification instead)

5 NO EXCEPTIONS POLICY

1. **NO SKIPPED STATEMENTS**: Every mathematical claim must be marked
2. **NO PARTIAL MARKS**: Each statement gets exactly one mark
3. **NO CONDITIONAL MARKS**: Do not use phrases like "correct if..." - determine the truth value
4. **NO MIDDLE POSITIONS**: There is no "partially correct" or "mostly right"

6 MANDATORY DOCUMENTATION

For each statement you evaluate, you **MUST** provide:

1. **Mark Assignment**: Exactly one mark (<#2705>, <#274C>, or <#1F7E1>)
2. **Computational Work**: Show your mathematical verification steps
3. **Logical Analysis**: Identify the claim structure and verify each part
4. **Specific Reasoning**: State exactly why you assigned your mark
5. **Counterproof Requirement**: If marking RED X, provide complete mathematical counterproof
6. **Ignorance Declaration**: If marking YELLOW, explicitly detail your failure to understand

7 VERIFICATION EXAMPLES

7.1 Correct Approach for Equivalence Claims

For claim "A $\iff$ B":

1. Prove A $\implies$ B by direct mathematical argument
2. Prove B $\implies$ A by direct mathematical argument
3. Verify both directions are logically sound
4. Mark <#2705> GREEN CHECK only after both directions verified
5. If either direction fails, provide counterproof and mark <#274C> RED X

7.2 Correct Approach for Formula Claims

For claimed formula $F = G$:

1. Start with left-hand side F
2. Apply definitions and perform algebraic manipulations
3. Show that this equals right-hand side G

4. Verify all steps are mathematically valid

5. Check that all operations are well-defined

6. Mark <#2705> if verification succeeds, <#274C> if counterexample found

8 FINAL REQUIREMENTS

1. Complete verification for **every single distinguishable statement**

2. Assign exactly one mark to **every statement**

3. Provide explicit mathematical reasoning for **every mark assigned**

4. Do not skip any statement as "obvious," "familiar," or "minor"

5. If genuinely unable to verify, mark <#1F7E1> and detail your failure - do not guess

REMEMBER:

- Mathematical truth is determined by rigorous proof, not by intuition or familiarity

- Your task is to verify what the mathematics actually says, not what you expect it to say

- Marking something wrong requires proof of its incorrectness

- Every mathematical statement in the document must receive exactly one mark

- There are no exceptions to these requirements