APM 4663/5663—Fall 2024

Small Assignment #1

Due date: Sunday, September 15, 2024

Instructions: First watch the corresponding short videos on proof techniques, quantifiers, and induction in Moodle, then answer the questions below (a couple of sentences suffice for each problem; you don't need to have scratch work for these assignments). Upload your solutions to Moodle.

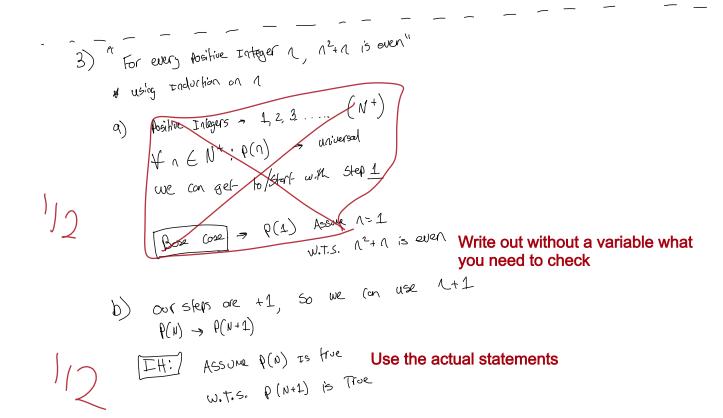
- 1. (2 pts.) Consider the following statement: "For every integer $n, n^2 + n$ is even."
 - (a) How do you start to prove that this statement is true? (Indicate in a sentence the variable that you fix and what you need to show. Do not actually prove the statement.)
 - (b) What do you need to prove to show that this statement is false? (Negate the above statement and simplify so that your answer does not contain any negations.)
- 2. (3 pts.) Consider the following statement: "If n^2 is even, then n is even."
 - (a) State what you assume and what you need to show if you want to use the direct proof method.
 - (b) State what you assume and what you need to show if you want to use the contrapositive proof method.
 - (c) State what you assume and what you need to show if you want to use proof by contradiction (indirect proof).
- 3. (2 pts.) Consider the following statement: "For every positive integer $n, n^2 + n$ is even."

We want to prove this statement using induction on n.

- (a) What is the base case we would need to check? (Just state what needs to be checked. No need to actually check it.)
- (b) What is the induction hypothesis, and what do we need to prove for the induction step? (Just state the induction hypothesis and what we need to show. Do not prove it.)

You don't need to actually prove/disprove the statements in the above problems.

You may resubmit the assignment by the end of Monday, Oct 7 with no penalty.	
	Small Assignment 1 Sunday, September 15, 2024 5:07 PM Matthew 1, Horsett OF.
	1) "For every Integer n, n2+ n is even"
	a) I would fix N to be a triable belonging to all Integers. I would then show that for all on N needs to work, This would be a universal qualifier, All on N needs to work, This would be a universal qualifier, All on N needs to work,
	This would be a universal effect. b) To show its false, we would wont to fix M to be an Integer, and What do you need to do? What do you need to do? Use the word in the table in the notes on quantifiers. we recommend the false. This would be an existential quantifiers. we recommend the with the false. The evolvate out s.t. N2+N is odd to prove the with the false.
•	a) "If 12 is even, then 1 is even"
	q) For Pirect Proof: $P \rightarrow Q$ AGSIME n^2 is even WITS a is even
	b) For Contra positive: $\rho \rightarrow Q \leftarrow \frac{1}{2} \rightarrow $
 _	() For contradiction (Indicat): Assume that the implication is false, i.e W. T. S. 1 is add (wh show?



Small Assignment 1 Corrections

Sunday, October 6, 2024 8:01 PM

1) "For every taleger N, N2+N is even"

A

B) (orrection:

5.t. For some 12 that is an integer, $n^2 + n$ is odd.

2) "IF N2 is even, then N is even'

A) <

B) Correction:

for Contrapositive, Assume Q is False Show P is False P - Q => 70 -> 7P

ASSUME: M is odd (Not even) W.T.S.: Mis odd (Not even)

() Correction:

Assure: M^2 is even, and M is odd w.t.s: These assumptions will lead to a Contradiction, likely with seeing what an odd M squared is.

- 3) "For every positive Integer 1, 12+11 is even"
 - A) Correction: Using Induction on M, what is the base case?

 Bose cone: N=1

 The Wave Care would be checking if 12+1 i's even.
- B) Correction: what is the IH, and what do we need to Prove for the Induction step?

 IH: Assure $N^2 \cdot N$ is even

I step: we wont to prove this will hold for N+1, so we wont to show $((N+1)^2 + (N+1))$ is also even.