

Updated February 20, 2019.

Instructions

Post-class assignments are intended to help you clarify your understanding of the big ideas in the course. They will be graded on a rough five-point scale. You are welcome to collaborate with classmates or visit me during office hours, but your final submission must be your own work. Typeset your solution in \LaTeX unless stated otherwise. Submit both your pdf and tex files via email by 11:59 pm on the due date with [2200] and the problem number in the subject line (e.g., [2200] Problem 1).

Problem 1 (Due January 25)

Download the file “Post-Class Problem 1” from the course website. Use \LaTeX to recreate its contents exactly (with the exception of updating the name and date).

Problem 2 (Due January 30)

Let a , b , and c be odd integers. Prove that $a + bc$ is an even integer.

Problem 3 (Due February 1)

(You may submit this problem in writing rather than in \LaTeX .)

Complete the following exercises from the end of Section 2.1 in the text: 5d, 6a, and all parts of 9.

Problem 4 (Due February 4)

(You may submit this problem in writing rather than in \LaTeX .)

Definition. We say an integer k **divides** another integer n provided we can write $n = km$ for some integer m . (For example, 3 divides 15 since $15 = 3 \cdot 5$.)

Part A

The following proposition is true. You do not need to prove it.

Proposition. If a divides b and a divides c , then a divides $b + c$.

Write the inverse, converse, and contrapositive of this proposition. (Don't forget to apply DeMorgan's Law.) Which of these is equivalent to the original proposition? For the others, provide a specific example of a , b , and c where the statement fails to be true.

Part B

Show that the following statement is not true in general by writing its negation and giving a specific example where the negation is true.

If a divides bc , then a divides b or a divides c .

Problem 5 (Due February 6)

(You may submit this problem in writing rather than in \LaTeX .)

Complete the following exercises from the end of Section 2.3 in the text: 5de and 6ce

Problem 6 (Due February 8)

(You may submit this problem in writing rather than in \LaTeX .)

Complete the following exercises from the end of Section 2.4 in the text: 3ab and all parts of 8

Problem 7 (Due February 15)

Prove the following statement by contraposition (see exercise # 9 from Section 3.2 in the text for more details):

Let $x \in \mathbb{R}$. If x is irrational, then \sqrt{x} is irrational.

Problem 8 (Due February 22)

Prove the following statement by contradiction.

If x is irrational and y is any real number, then $x + y$ is irrational or $x - y$ is irrational.

Problem 9 (Due February 27)

Prove the following statement by case analysis.

For each integer n , if $n \not\equiv 0 \pmod{3}$, then $n^2 \not\equiv 0 \pmod{3}$.