

Math 307

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Fall 2016

Name:

Student ID (last 6 digits): XXX-

MIDTERM 1

You have 50 minutes to complete the exam. Do all work on this exam, i.e., on the page of the respective assignment. Indicate clearly, when you continue your solution on the back of the page or another part of the exam.

Write your name and the last six digits of your student ID number on the top of this page. Check that no pages of your exam are missing. This exam has 6 questions and 8 printed pages (including this one and a page for scratch work in the end).

No books or notes are allowed on this exam!

Show all work! (Unless I say otherwise.) Correct answers without work will receive **zero**. Also, **points will be taken from messy solutions**.

Good luck!

Question	Max. Points	Score
1	15	
2	15	
3	20	
4	15	
5	15	
6	20	
Total	100	

1) [15 points] Fill in the truth-table below:

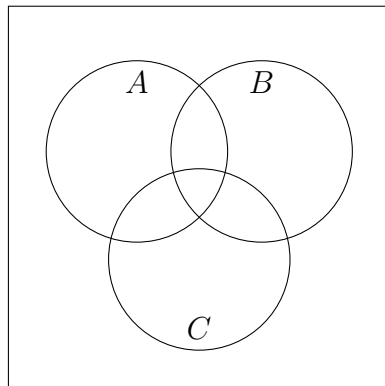
P	Q	R	$\neg Q \wedge R$	$\neg P \vee R$	$[\neg Q \wedge R] \rightarrow [\neg P \vee R]$
T	T	T			
T	T	F			
T	F	T			
T	F	F			
F	T	T			
F	T	F			
F	F	T			
F	F	F			

2) [15 points] Use the rules of formal logic to simplify $\neg(\neg P \wedge Q) \vee (P \wedge \neg R)$. **In each step, state which rule you've used!**

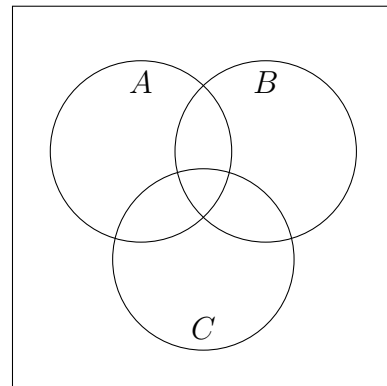
[Hint: It should simplify to $P \vee \neg Q$.]

3) Sets and Venn Diagrams:

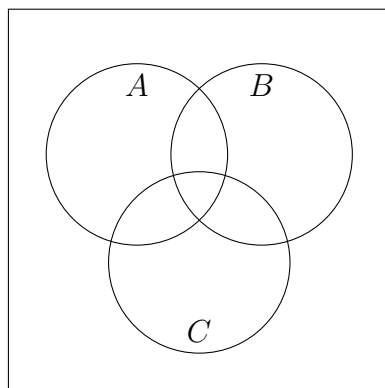
(a) [10 points] Fill in the following Venn Diagrams:



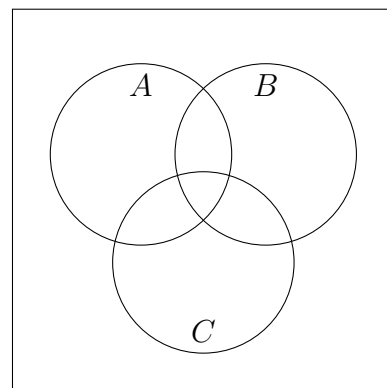
$$A \setminus B$$



$$(A \setminus B) \setminus C$$



$$A \cap C$$



$$(A \setminus B) \cup (A \cap C)$$

This problem continues on the next page!

(b) [10 points] Give concrete examples of A , B and C for which

$$(A \setminus B) \setminus C \neq (A \setminus B) \cup (A \cap C).$$

4) [15 points] Rewrite $\neg(P \leftrightarrow Q)$ using only \wedge , \vee and \neg [and P and Q , of course]. **You do not need to simplify your answer!**

5) [15 points] Show that $A \cup (B \setminus C) = (A \cup B) \setminus (C \setminus A)$ by showing that $x \in A \cup (B \setminus C)$ is [logically] equivalent to $x \in (A \cup B) \setminus (C \setminus A)$.

6) Analyze the logical form of the following statements.

(a) [10 points] You will pass this test and be happy as long as you've studied or are used to logic.

(b) [10 points] Being relaxed but attentive is necessary, but not sufficient, to do well in exams.

Scratch: