

Name: _____

Math 245 Spring 2013 Midterm

Please read the following directions.

PLEASE DO NOT BEGIN THE EXAM UNTIL INSTRUCTED TO DO SO.

Books and notes are permitted on this exam, but not calculators, computers, or other electronic aids. Please write legibly, with plenty of white space. Please print your name in large letters in the space provided. Please fit your answers in the designated areas. Show all necessary work in your solutions; if you are unsure, show it. Erase work you do not wish graded; incorrect work can lower your grade. **There is no need to include scratch work, side calculations, dead ends, or “Givens/Goal” tables – only correct and complete answers.**

Problem	Your Grade	Max Grade
1		10
2		10
3		10
4		10
5		10
6		10
7		10
8		10
9		10
10		10
TOTAL		100

Daily Grade Average (dropping 3)	
# Absences	
# Stars	
Grade so far	

Do you wish to spend all your stars so far to raise your midterm grade? (pick one)

Raise that grade!	
Save those stars.	

(1) [1.2.17] Find a formula involving the connectives \vee , \wedge , and \neg that has this truth table:

P	Q	???
F	F	F
F	T	T
T	F	T
T	T	F

(2) [1.4.15] What can we put in the blank to make the identity correct?

$$(A \Delta B) \cap C = (C \setminus A) \Delta \underline{\hspace{2cm}}$$

(3) [1.5.9] Find a formula involving only the connectives \neg and \rightarrow that is equivalent to $P \leftrightarrow Q$.

(4) [2.2.10] Determine whether or not the following statements are equivalent.

$$\begin{aligned} &(\exists x \in A P(x)) \wedge (\exists x \in B P(x)) \\ &\exists x \in (A \cap B) P(x) \end{aligned}$$

(5) [2.3.10] Prove that $\mathcal{P}(A \cap B) = \mathcal{P}(A) \cap \mathcal{P}(B)$.

(6) [3.1.8] Suppose that $A \setminus B \subseteq C \cap D$ and $x \in A$. Prove that if $x \notin D$ then $x \in B$.

(7) [3.2.10] Suppose that $x, y \in \mathbb{R}$. Prove that if $x \neq 0$, then if $y = \frac{3x^2+2y}{x^2+2}$ then $y = 3$.

(8) [3.3.2] Prove that if A and $B \setminus C$ are disjoint, then $A \cap B \subseteq C$.

(9) [3.4.10] Prove that for every integer n , n^3 is even iff n is even.

(10) [3.5.8] Prove that for any sets A and B , if $\mathcal{P}(A) \cup \mathcal{P}(B) = \mathcal{P}(A \cup B)$ then either $A \subseteq B$ or $B \subseteq A$.

Group Registration Form

Please detach this page from the midterm. Please submit one such form, per group. Forms are due by the start of class on Thursday, March 14. Anyone not registered in a group will be expected to work individually for the rest of the semester.

Group name: _____

Member: _____

Member: _____

Member: _____

Member: _____