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| Exam Total/50: | Quiz Ave:   | Name: |
| Exam Percent:  | Course Ave: |       |

## Spring 2016 Math 245 Mini Midterm 1

Please read and follow these directions:

Please write legibly, with plenty of white space. Please print your name in the designated box, similarly to your quizzes. Please fit your answers in the designated areas. To get credit, you must also show adequate work to justify your answers. If unsure, show the work. All problems are worth 5-10 points. The use of notes, calculators, or other materials on this exam is strictly prohibited. This exam will last 30 minutes; pace yourself accordingly. Please remain seated until the end, to ensure a quiet test environment for others. Good luck!

Problem 1. Draw a circuit corresponding to  $(P \wedge Q) \vee (P|R)$ . Label carefully.

Problem 2. Fill in the blanks (including line numbers, where needed), to prove the following theorem:  $((\neg p \vee r) \wedge (t \rightarrow q) \wedge (q \rightarrow p)) \rightarrow r$

|    | proposition       | justification |
|----|-------------------|---------------|
| 1. | $(\neg p) \vee r$ | hypothesis    |
| 2. | $t \rightarrow q$ | hypothesis    |
| 3. | $q \rightarrow p$ | hypothesis    |
| 4. | $t$               | _____         |
| 5. | $q$               | _____         |
| 6. | _____             | _____         |
| 7. | $\therefore r$    | _____         |

Problem 3. Carefully define each of the following terms:

a. contradiction

b. vacuously true

c. converse

d. disjunctive addition

e. predicate

Problem 4. Write and simplify the negation of the proposition:

$$\forall x \in \mathbb{R}, \text{ if } x(x + 1) > 0 \text{ then } x > 0 \text{ or } x < -1.$$

Problem 5. Prove that the conditional proposition  $p \rightarrow q$  is equivalent to its contrapositive.