Selected Review Problems (pp. 111-113)

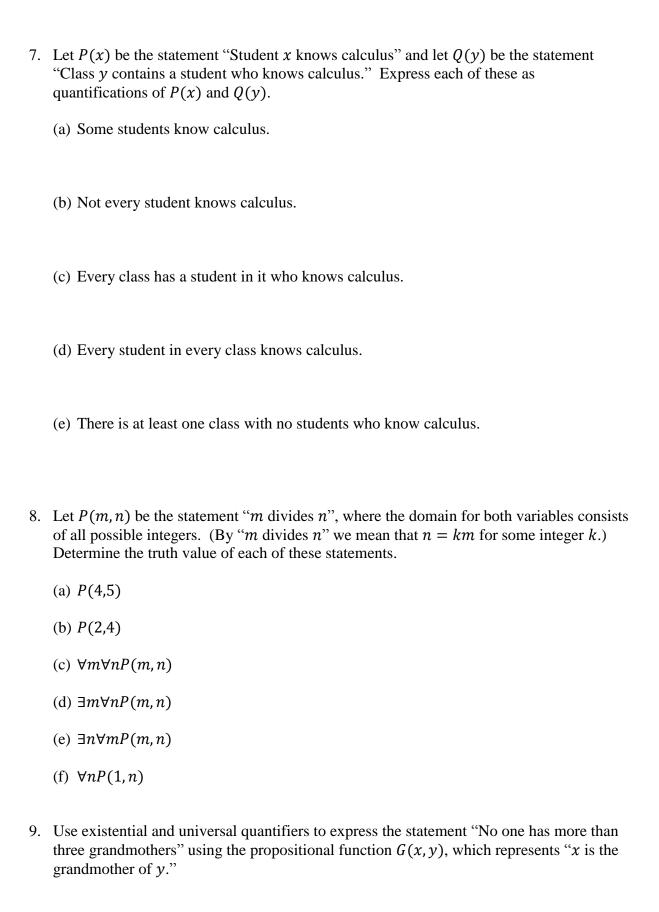
- 1. Let p be the proposition "I will do every exercise in this book" and q be the proposition "I will get an A in this course". Express each of these as a combination of p and q.
 - (a) I will get an A in this course only if I do every exercise in this book.
 - (b) I will get an A in this course and I will do every exercise in this book.
 - (c) Either I will not get an A in this course or I will not do every exercise in this book.
 - (d) For me to get an A in this course, it is necessary and sufficient that I do every exercise in this book.
- 2. Find the truth table of the compound proposition $(p \lor q) \to (p \land \neg r)$.

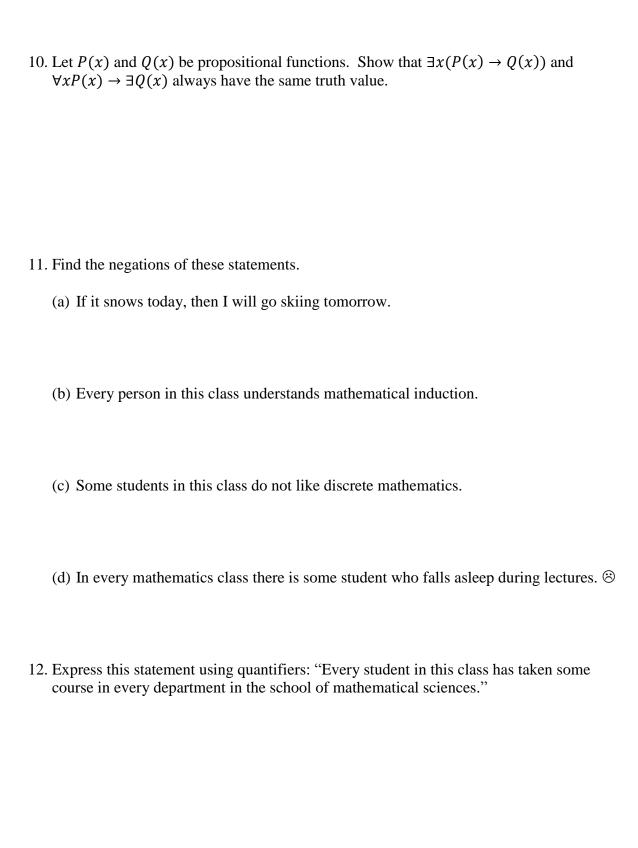
3. Show that these compound propositions are tautologies.

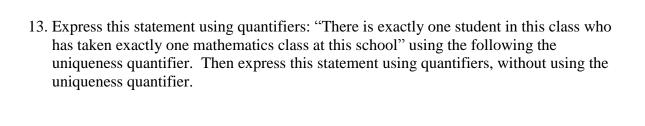
(a)
$$(\neg q \land (p \rightarrow q)) \rightarrow \neg p$$

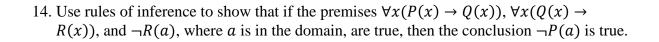
(b)
$$((p \lor q) \land \neg p) \rightarrow q$$

4. Find a compound proposition involving the propositional variables p, q, r, and s that is true when exactly three of these propositional variables are true and is false otherwise. 5. Show that these statements are inconsistent: "If Miranda does not take a course in discrete mathematics, then she will not graduate." "If Miranda does not graduate, then she is not qualified for the job." "If Miranda reads this book, she is qualified for the job." "Miranda does not take a course in discrete mathematics, but she reads this book." 6. Hearken back to the times of knights and knaves where knaves always lie and knights always tell the truth. Suppose you meet three people, Anita, Boris, and Carmen. What are Anita, Boris, and Carmen if Anita says, "I am a knave and Boris is a knight" and Boris says, "Exactly one of the three of us is a knight."









15. Prove that if x^3 is irrational, then x is irrational.

16. Prove that if x is irrational and
$$x \ge 0$$
, then \sqrt{x} is irrational.