Math205 Test 2: Logic

October 14th, 2008

Answer all questions and give complete reasons and checks for your answers. The parts of the questions are weighted as shown and the questions can be answered in any order. Start a fresh side of paper for each question.

1. (a) Use algebra to identify which part of the real line these logic expression are true in: [3]

$$p(x) \equiv \text{``}|3x + 2| \leq 6\text{''} , \quad q(x) \equiv \text{``}x^2 > 4\text{''}$$

   (b) Which of these statements is true and which is false? [4]

$$\exists x \in \mathbb{R} \quad ; \quad p(x) \wedge q(x)$$
$$\forall x \in \mathbb{R} \quad ; \quad p(x) \vee q(x)$$
$$\exists x \in \mathbb{Z} \quad ; \quad p(x) \wedge q(x)$$
$$\forall x \in \mathbb{Z} \quad ; \quad p(x) \vee q(x)$$

   (c) Negate either $p(x)$ or $q(x)$, giving your answer in both algebra form and indicating the range on a real line. [2]

2. (a) Simplify this logic expression using the rules of logic algebra [8]

$$y \rightarrow (w \leftrightarrow y)$$

   (b) Check your answer with truth tables. [3]