Math 205 2009 Test 2

October 21$^{\text{st}}$, 2009

Answer all questions and give complete reasons and checks for your answers. Don't erase any of your working, just cross it out if you think it is incorrect. The parts of the questions are weighted as shown and can be answered in any order.

1. Prove, using the contradiction method, that the difference between the squares of two odd integers is an even number. [7]

2. (a) Identify the regions of the real line for which these propositions are true. [2]

$$p(x) \equiv \text{``}|2x + 3| > 4\text{''} , \quad q(x) \equiv \text{``}x + \pi \le 0\text{''}$$

   (b) Are these propositions true or false? Give algebra to show why. [6]

$$\forall x \in \mathbb{R} \quad ; \quad q(x) \to p(x)$$
$$\forall x \ge 1 \quad ; \quad p(x) \vee q(x)$$
$$\exists x \in \mathbb{Z} \quad ; \quad (\sim p(x)) \wedge (\sim q(x))$$

3. Use logic to simplify this expression and check your answer with truth tables. [5]

$$(r \to s) \vee r$$