Math205 Test 1

September 28, 2006

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. The universal set in this question is the following set of names of colours:
   $\mathcal{U} :=$ {red, yellow, green, blue, brown, purple, black, orange, grey, pink, teal}

   (a) Determine the members of the following sets and thus their cardinalities. [3]
   A = {the colours with less than five letters in}
   B = {the colours with only one (perhaps repeated) vowel}
   C = {the colours containing the letters l or p}

   (b) Create a Venn diagram using these elements. [3]

   (c) Identify the elements contained in the set $\overline{(A \cup B)} \cap C$ by means of the diagram and verify your answer by considering the consituent sets. [2]

   (d) Give examples of sets which have cardinality 0 and 3 in the Venn diagram and identify them in terms of A, B and C. [2]

2. (a) Use the rules of logic to simplify this expression as much as possible. [7]

$$(p \vee q) \rightarrow (p \wedge (\sim q))$$

   (b) Verify your answer using a truth table. [3]