Math205 Test 1: Sets and Venn Diagrams

September 23, 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) Simplify this set algebra expression using the rules, one at a time: [6]

$$(Z \cup X) \cap (\overline{Z} \cap (X \cup Y))$$

(b) Verify your answer by creating the Venn diagrams of the constituent expressions and combining them. [4]

2. (a) Given this universal set, list it in increasing order and then identify which elements from it are in the following sets, explaining why. [6]

$$\mathcal{U} \ := \ \left\{ 2, 1, \frac{1}{3}, -1, 0, \frac{-1}{2}, \frac{1}{2}, \frac{5}{2}, \frac{3}{5}, \frac{2}{3} \right\}$$
$$A \ := \ \{ x \mid |x - 1| \geq 1 \}$$
$$B \ := \ \{ y \mid 3y^2 < 1 \}$$
$$C \ := \ \{ \text{elements that contain a numeral 2 somewhere} \}$$

(b) Identify an element not from $\mathcal{U}$ that would be in $A \cap B \cap C$ and check it satisfies each condition. [2]

(c) If there were only integers in the universal set, explain which areas of the Venn diagram would have to be empty. [2]