

# Math 205 2009 Test 1

September 28<sup>th</sup>, 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. The universal set in this question is

$$\mathcal{U} := \{-2, 5.7, -1.4, 8, 1, 1.3, 4, \pi, 0, -3, 4.5\}$$

- (a) Draw the Venn diagram of these sets, explaining how you got their contents: [4]

$$D := \{d \in \mathcal{U} \mid d^2 - 3d \leq 10\}$$

$$E := \{2e \in \mathcal{U} \mid e \in \mathbb{Z}\}$$

$$F := \{f \in \mathcal{U} \mid \left| \frac{f}{2} + 0.2 \right| < 1.4\}$$

- (b) Verify the inclusion-exclusion formula for  $D$  and  $E$ . [2]

- (c) If  $\mathcal{U}$  was a different set give a number which would be in  $D \cap E$ . Explain why  $F \subseteq D$  for any  $\mathcal{U}$  and give a universal set in which  $D = F$ . [4]

2. (a) Simplify this expression using algebra, naming all your steps: [5]

$$(X \cup Y)^c \cap (Y \cup Z)$$

- (b) Check your answer by using Venn diagrams. [2]