Comments on G12RAN exam 1999-2000

Here are some comments on the performance on the 1999-2000 Real Analysis paper.

1.(a) Some students appeared to believe that a set is countable if and only if it is finite. Others believed that a set A is countable if and only if there is a surjection from A onto $\mathbb{N}$. (Neither of these beliefs is correct.)

(b) The Cantor diagonalization argument was mostly well done, but some students had notational problems, attempting to define a decimal expansion as $0.b_{ij}\cdots$.

(c) Several students were confused about the Cartesian product

$$A \times B = \{(a, b) : a \in A, b \in B\}.$$

(Some thought that this meant a set of real numbers $\{a \cdot b : a \in A, b \in B\}$.)

(d) Many students did not realize that the contrapositive of (b) immediately tells you that (i) implies (ii).

2.(a) Some candidates were unable to distinguish between continuity and uniform continuity.

(b) Most people found the correct answer, but the justification given was often too informal. Some argument involving sequences and the density of the rationals and irrationals should be used.

(c) For the most part this was very poorly done: the students were unable to interpret what these conditions really meant.

3. Few attempted this question: perhaps the problem was a lack of confidence with uniform continuity.

4. This question was mostly well done. The only real problem was that many candidates could not state Rolle's theorem correctly.

5. This question was very popular and was done well by most students. The L'Hôpital's rule parts were very well done. The Taylor's theorem section was usually not rigorous enough (the formula for the error term in Taylor's theorem should be stated), but most students obtained a good estimate.

6. This question was the least attempted of all, and most attempts were poor. Some students became confused between derivative and antiderivative, and attempted (in (c)) to find a discontinuous function which has a derivative. (This is impossible!) However, there were a few excellent solutions to this question.