MA 101 (Mathematics I)
Marking scheme of End-semester Examination (Calculus)

4. For getting the correct conclusion (TRUE/FALSE), the marking scheme will be as follows.

(a) For complete correct justification : 2 marks (no partial marks)

(b) For defining (x_n) correctly (and completely) : 2 marks (no partial marks)

(c) For complete correct justification : 2 marks (no partial marks)

(d) For defining f correctly : 2 marks (no partial marks)

(e) For defining f correctly : 1 mark
For finding F correctly : 1 mark

5. Applying root test to show that $a_n \to 0$: 1 mark
After that, finding $\lim_{n\to\infty} x_n$ correctly : 1 mark

6. For choosing the correct sequence (y_n) and applying limit comparison test
(*i.e.* calculating $\lim_{n\to\infty} \frac{x_n}{y_n}$) : 2 marks
For concluding the correct values of p (in the form of 'iff' or mentioning both convergence and divergence after the correct application of limit comparison test) : 1 mark

7. For defining min and max for $|f|$ correctly and observing that they are attained by $|f|$ on $[-1, 1]$: 1 mark
For observing that $|f|$ is continuous : 1 mark
Applying IVP to $|f|$ to get the result : 2 marks

8. For getting $f(c) = \frac{1}{2}$ by applying IVP for the continuous function f : 1 mark
Applying MVT in both intervals : 2 marks
Getting the final answer : 1 mark

9. For writing $R_n(x)$ correctly specifically for $\log(1+x)$: 1 mark
For showing $R_n(x) \to 0$ for $0 \le x < 1$: 1 mark
For showing $R_n(x) \to 0$ for $-\frac{1}{2} < x < 0$: 2 marks

10. For choosing f correctly and showing that $\lim_{x\to\infty} f'(x) = 1$: 2 marks
For applying MVT and getting the final answer : 2 marks

11. For showing convergence of $\int_1^2 f(x)\, dx$: 2 marks

For showing convergence of $\int_2^\infty f(x)\, dx$: 2 marks

In each of the above cases, 1 mark will be given for choosing g (respectively, h) correctly and applying limit comparison test correctly.

12. For complete correct integral expression (including correct limits) for the required area : 2 marks
For correct final answer : 1 mark

13. For complete correct integral expression (including correct limits) for the required volume (irrespective of final answer) : 2 marks

The notations and terminologies used here refer to those given in the model solutions.