Queen Mary
University of London

MTH4100 Calculus 1
Learning Outcomes and Final Examination Autumn 2009

On completion of this course students will be expected to

1. be able to solve algebraic equations and inequalities involving the square root and modulus function
2. understand the difference between equations and identities, and be able to prove simple identities and inequalities
3. know addition and double-angle formulas for trigonometric functions and use them to express values of trigonometric functions in the surds form
4. be able to recognize odd, even, periodic, increasing, decreasing functions
5. understand the operation of composition of functions and the concept of functional inverse
6. to able to recognize linear, quadratic, power, polynomial, algebraic, rational, trigonometric, exponential, hyperbolic and logarithmic functions and sketch their graphs
7. be able to calculate limits by substitution and by eliminating zero denominators
8. be able to calculate limits at infinity of rational functions
9. be able to calculate limits in indeterminate forms by a repeated use of l'Hôpital's rule
10. know derivatives of power, trigonometric, exponential, hyperbolic, logarithmic and inverse trigonometric functions
11. know the basic rules of differentiation and use them to find derivatives of products and quotients
12. know the chain rule and use it to find derivatives of composite functions
13. be able to use derivatives to find intervals on which the given function is increasing or decreasing
14. find maxima and minima, critical points and inflection points of functions and to determine the concavity of curves
15. be able to sketch graphs of rational functions including finding asymptotes
16. be able to find tangents and normals to graphs of functions given in explicit, implicit and parametric forms
17. understand the concept of indefinite integral as anti-derivative
18. know standard indefinite integrals and basic rules of indefinite integration
19. be able to evaluate integrals by substitution with and without suitable hints
20. be able to evaluate integrals of rational functions by partial fractions
21. be able to evaluate integrals by a repeated use of integration by parts
22. understand the concept of definite integral and know the basic properties of definite integrals
23. know the fundamental theorem of calculus and be able to use it for evaluating definite integrals and derivatives of integrals with variable limits of integration
24. understand the concept of area of regions with curvilinear boundaries, be able to find area between curves
25. be able to convert cartesian coordinates in polar coordinates and vice versa.

Warnings

1. The above is intended as a *minimal* list to be mastered in order to be reasonably sure of *passing* the examination.
2. Just because knowledge of a particular definition, formula or statement of a theorem is in the list of 'Learning outcomes' above does not guarantee that it will be on the examination paper. However, a good proportion will be, so they are worth knowing well.

Final Examination

The duration of this examination is 2 hours, and it will supposedly take place in May 2010. The rubric will state:

You should attempt all questions. Marks awarded are shown next to the questions.

Calculators are NOT permitted in this examination. The unauthorized use of a calculator constitutes an examination offence.

Complete all rough workings in the answer book and cross through any work which is not to be assessed.

Candidates should note that the Examination and Assessment Regulations state that possession of unauthorized materials by any candidate who is under examination conditions is an assessment offence. Please check your pockets now for any notes that you may have forgotten that are in your possession. If you have any, then please raise your hand and give them to an invigilator now.

Exam papers must not be removed from the examination room.

Rainer Klages, September 2009