

Topics for Test 1

Numerical integration, Trapezoid and Simpson plus error estimates.

You should remember the trapezoid rule and the error bound. If I want you do use Simpson's rule I'll give you the general formula and the error bound. But you have to able to put several steps together and use it.

Improper integrals

You have to be able to decide in a number of simple cases whether an improper integral exists or not. In particular I expect you to be able to handle certain integrals that cannot be computed explicitly. Among the techniques are, direct comparison test, limit comparison theorem, p -test.

Differential equations

Separable differential equations, radioactive decay and population growth, Newton's equation of cooling, first order linear inhomogeneous equations, applications to mixing problems.

L' Hôpital's rule

You have to be able to use this rule for computing limits of the form

$$\lim_{x \rightarrow a} \frac{f(x)}{g(x)}$$

both $f(a)$ and $g(a)$ vanish at a . Likewise I expect you to be able to compute limits of the form

$$\lim_{x \rightarrow a} \frac{f(x)}{g(x)}$$

where $f(x)$ and $g(x)$ both tend towards ∞ as $x \rightarrow a$. You will use this technique when computing limits of sequences.

Sequences

You have to understand what it means that a sequence converges or diverges. You have to know rules for limits i.e., limits of sum equal sum of limits, limit of product equal product of limits limit of ratio equal ratio of limit provided that the limit of the denominator is not equal zero. You should be able to compute limits using simple techniques, like the sandwich theorem and using Hôpital's rule. Sequences defined recursively as well as the theorem about bounded monotonic sequences.

Series

Series as limits of partial sums, geometric series, telescoping series, the n -th term test for divergent series, combining series, sums of series, and multiplication of series by a constant. Reindexing of a series, Integral test, estimating remainder using the integral test and comparison test, limit comparison tests.