

Preparing for Exam 3

- The ideas are the most important thing!** And what are those ideas? A partial list is:

 - separation of variables to solve IVPs $y' = f(x)g(y)$, $y(a) = b$
 - numerical integration techniques: midpoint method, trapezoid method, simpson's rule
 - improper integrals of the first kind and of the second kind
 - rules for evaluating limits (L'Hopital's Rule, ignoring small terms, etc)
 - tests for convergence of infinite series **non-zero limit divergence test, alternating series, integral, comparison and absolute ratio tests**
 - useful series to remember are p -series, geometric series, harmonic series, alternating harmonic series
 - Taylor polynomials and Taylor series
- Problems will resemble homework, quiz and lab questions.** But they will not be identical to these. Infinite series take some time to absorb. We have not had a great deal of time. The test questions will reflect that fact.
- Practice using tests for convergence.** Especially important are the Absolute Ratio Test, Comparison test and the "Non-Zero Limit Divergence Test." Don't come into the exam without being able to take the limit as $k \rightarrow \infty$ of any expression involving k . Don't forget the other tests we have covered (the Integral Test and the Root Test) but remember that they are only for use on positive infinite series.
- Remember the basic idea of doing comparisons:

If you want to show that something CONVERGES, you have to compare it to something which is **LESS THAN OR EQUAL TO** something you already know CONVERGES.

If you want to show that something DIVERGES, you have to compare it to something which is **GREATER THAN OR EQUAL TO** something you already know DIVERGES.

The "something" can either be an improper integral or an infinite series, but in either case the integrand or terms must all be POSITIVE.
- Remember the rules of limits:

Taking the limit of $f(x)$ as x approaches c is NOT ALWAYS the same thing as "plugging in" the value c into the function $f(x)$, especially if the value c is **infinity**. You should remember that $\lim_{x \rightarrow \infty}$ means x is getting very very large and consider the corresponding behavior of the function. The Rules we developed in class for limits should help you evaluate limits. You should make up your own limit problems and try and do them. You can always make a table and set the trend for the input $\lim_{x \rightarrow \infty}$ to determine the trend as $f(x) \rightarrow f(\infty)$.

Limit Formulas

$$\int_a^{\infty} \frac{dx}{x^p} = \begin{cases} \text{DIVERGES} & \text{when } p \leq 1 \\ \text{CONVERGES} & \text{when } p > 1 \end{cases}$$

$$\int_0^b \frac{dx}{x^q} = \begin{cases} \text{DIVERGES} & \text{when } q \geq 1 \\ \text{CONVERGES} & \text{when } q < 1 \end{cases}$$

$$\lim_{x \rightarrow \infty} e^{kx} = \begin{cases} 0 & \text{when } k < 0 \\ \infty & \text{when } k > 0 \end{cases}$$

$$\lim_{x \rightarrow \infty} x^r = \begin{cases} 0 & \text{when } r < 0 \\ \infty & \text{when } r > 0 \end{cases}$$

$$\lim_{x \rightarrow 0^+} x^r = \begin{cases} \infty & \text{when } r < 0 \\ 0 & \text{when } r > 0 \end{cases}$$

Rules for the Exam

1. **BLUE NOTES:** You are allowed the attached half-sheet of “blue” notes for written notes. Only the use of notes on this blue sheet of paper will be permitted during the exam. **You may not use the program function of your calculator to store additional notes.** This policy will, of course, be reflected in test questions. There will be fewer problems involving simple calculations and more involving **concepts**.
2. You must take the exam during your regularly scheduled class time unless you have made prior arrangements with me.
3. As usual, there will be a pledge on the exam. By signing the pledge, you indicate that you followed all the rules of this exam and furthermore that you promise not to discuss the exam with anyone (even people who have already finished the exam) until after **3:30 pm on Friday, April 18, 2003**. Although each exam will be different, they will be similar enough to be fair to each group. It is our collective responsibility to keep the exam as fair as possible.
4. No answer will be given credit without accompanying work. No exceptions. Unless otherwise indicated, answers should be left in exact form, i.e. no decimal approximations. **If you say something converges/diverges you have to explain what rule you are using to prove convergence/divergence.** When taking limits I encourage you to use the table method to check your answers!
5. I can not stress strongly enough that you must write your solutions in a **intelligible** and **coherent** fashion. When you are writing a solution to a problem you are attempting to communicate with the reader (me) how you solved the problem. I can assure you that if I do not how you arrived at an answer, **YOU WILL NOT GET CREDIT**. The correct answer is important, yes, but assuring me that you know what technique needs to be used to arrive at this answer is more important. I would be very happy to see sentences written explaining your answers.
6. This list of rules is not necessarily exhaustive. If you have any questions about what is allowed and what is not, you are responsible for asking me. Ignorance is not an excuse.

BLUE NOTES

Name: _____

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Name: _____