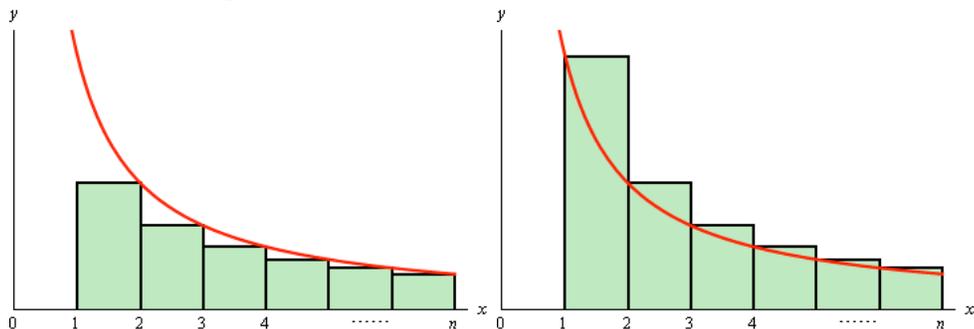


STUDY GUIDE FOR MIDTERM 2

Here's what you should know for this midterm.

- Sequences
 - Know the definition of a sequence and how it differs from a series.
 - Know what it means for a limit to converge or diverge, and what it means for the limit of a sequence to be L .
 - Be able to compute the limit of a sequence (we learned some rules and theorems for this: squeeze theorem, monotonic sequence theorem, etc. Make sure you know how/when to use them!)
- Series
 - Know the definition of a series and how it differs from a sequence
 - Know what it means for a series to converge or diverge. Know what it means if $\sum a_n = L$.
 - Be able to translate between $\sum a_n$ and $a_1 + a_2 + a_3 + \dots$ notation.
 - Know what a geometric series is, and be able to compute their sum.
 - Understand and be able to replicate how we show telescoping series like $\sum \frac{1}{n(n+1)}$ converge, and how harmonic series like $\sum \frac{1}{n}$ diverge.
 - Be able to identify what tests would be helpful to determine the convergence for a given series.
 - Know what conclusions you can make about the convergence of a series based on the limit of the underlying sequence, and vice versa.
- Integral Test
 - Know what conditions are needed to apply the integral test, and be able to apply it to test convergence.
 - Be familiar with pictures like these:



Be able to derive the inequalities that come from these kind of pictures. Be able to draw the pictures from the corresponding inequality.

- Know the conditions and statement for the remainder estimate for the integral test. Be able to apply it to estimate the error involved in some approximation.
- Comparison Tests
 - Know the statements of the comparison and limit comparison tests. Make sure you know what conclusions you can make (if any) in all possible cases $a_n \leq b_n$, $a_n \geq b_n$, $\sum a_n$ converges, $\sum a_n$ diverges.
 - Be able to look at a given series and find an effective comparison. Be able to carry out the relevant comparison test to determine convergence for the given series.
- Alternating Series
 - Know the definitions of: alternating series, absolute convergence, conditional convergence. Understand the relationship between absolute and conditional convergence.
 - Know the conditions for the alternating series test. Be able to apply it to show an alternating series converges.
 - Know the statement and conditions for the alternating series estimation theorem. Be able to apply it to estimate the error involved in some approximation.
- Ratio Test, Root Test
 - Know the statements of the ratio and root tests
 - Be able to apply these tests to determine convergence for a given series.