LECTURE OUTLINE
The Practice Exam

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Math 8

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Goals

Review For Midterm

Deciding On The Technique

Basic Techniques

Basic Rules: (For example) If $\sum a_n$ converges to s, then $\sum ca_n$ converges to cs.

The Basic Sequence Fact: $\lim_{x\to\infty} f(x) = L$, then $\lim_{n\to\infty} f(n) = L$.

Facts: geometric series $\sum_{n=1}^{\infty} r^n = \frac{r}{1-r}$ and **p-test** $\sum_{n=1}^{\infty} \frac{1}{n^p}$ converges if $p > 1$ and diverges for $p \leq 1$.

Summation Tests

Divergence Test: $\sum a_n$ diverges if $\lim a_n \neq 0$.

Integral Test: If $f(x)$ is continuos, positive and decreasing on $[1, \infty]$ and $\int_1^\infty f(x)dx$ converges [or diverges], then $\sum f(n)$ converges [or diverges].

Comparison Test: Suppose $0 \leq a_n \leq b_n$. If $\sum b_n$ converges, then $\sum a_n$ converges; while if $\sum a_n$ diverges then $\sum b_n$ diverges.

Limit Comparison Test: Suppose a_n and b_n are positive and $0 < \lim_{n\to\infty} \frac{a_n}{b_n} = c < \infty$. If $\sum a_n$ converges [or diverges], then $\sum b_n$ also converges [or diverges].

Alternating Series Test: Suppose b_n are positive with $b_{n+1} < b_n$ and $\lim_{n\to\infty} b_n = 0$, then $\sum(-1)^{n-1}b_n$ converges.

Integration Techniques

When a a simple u-substitution does not seem to help....

Integration by Parts: When you see a product of distinct types of functions or you are integrating something whose derivative you know to be a rational function.

Trigonometric Substitution: When you see a $\sqrt{a^2 \pm x^2}$ type term .

Trigonometric Integrals: When you see powers of trig functions.

Partial Fractions When you are integrating a rational function (with degree of the numerator less than the degree of the denominator).