Preparing for Midterm #2

MATH 126 — Calculus II
Friday, Nov 13

Please print your name:

Problem 1. Go over all the quizzes!

To help you with that, there is a version of each quiz posted on our course website without solutions (of course, there's solutions, too).

Problem 2. Determine the following limits.

(a) $\lim_{n\to\infty} \frac{1+\log(n)}{1+n^{3/2}}$

(b) $\lim_{n\to\infty} \frac{5^n+3^n}{4^n-1}$

(c) $\lim_{n\to\infty} \left(1-\frac{1}{2n}\right)^n$

Problem 3. Suppose that $\lim_{n\to\infty} a_n = L$.

(a) Determine: $\lim_{n\to\infty} a_n^2$

(b) Determine: $\lim_{n\to\infty} a_{n^2}$

(c) Suppose further that $a_{n+1} = 2 - \frac{a_n}{3}$. What is L?

Problem 4. Determine whether the following series converge.

(a) $\sum_{n=1}^{\infty} \frac{7\sqrt{n}+\log(n)}{n^2+4}$

(b) $\sum_{n=2}^{\infty} \frac{\sqrt{n}}{10\log(n)}$

(c) $\sum_{n=1}^{\infty} \frac{n-4}{n^2+\log(n)}$

(d) $\sum_{n=0}^{\infty} \frac{(-4)^n}{7n^2+1}$

Problem 5. Using the integral test, determine whether the series $\sum_{n=2}^{\infty} \frac{1}{n(\log n)^{3/2}}$ converges.

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Problem 6. For which values of x does $\sum_{n=2}^{\infty} \frac{(-1)^n x^n + 1}{3^n}$ converge?

Evaluate the series (as a function of x) for these values.

Problem 7. Determine the radius of convergence of the following power series.

(a) $\sum_{n=2}^{\infty} \frac{n!(x+1)^n}{10^n}$

(b) $\sum_{n=1}^{\infty} \frac{(x-2)^n}{n 3^n}$

(c) $\sum_{n=0}^{\infty} \binom{2n}{n} x^n$ Recall that $\binom{2n}{n} = \frac{(2n)!}{n!n!}$.

Problem 8.

(a) Integrate both sides of $\sum_{n=0}^{\infty} x^n = \frac{1}{1-x}$. By choosing the appropriate constant of integration, find a power series for $\log(1-x)$.

(b) What is the radius of convergence of this power series?

(c) Does the power series converge for $x = 1$? On the other hand, it turns out that it does converge for $x = -1$. Write down the first few terms of the series in the case $x = -1$.

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