

SAMPLE FOR MIDTERM 2
Math 1220, Calculus II

1

Compute the following limits:

$$\lim_{n \rightarrow \infty} \left(\frac{n-1}{n+1} \right)^n \quad \lim_{n \rightarrow \infty} \frac{\sin n}{\sqrt{n}} \quad \lim_{n \rightarrow \infty} \cos(\pi n) \arctan(n)$$

2

Compute the sum of the following series:

$$\sum_{k=2}^{\infty} \frac{5^k + 1}{8^{k-1}} \quad \sum_{n=1}^{\infty} \log \left(\frac{1 + \frac{1}{n+1}}{1 + \frac{1}{n}} \right)$$

3

Determine whether the following positive series converge or diverge.

$$\sum_{n=1}^{\infty} \frac{4n^3 + 3n}{n^5 - 4n^2 + 1} \quad \sum_{n=2}^{\infty} \frac{1}{\ln(\ln(n))} \quad \sum_{n=2}^{\infty} \left(1 - \frac{1}{n} \right)^n \quad \sum_{n=0}^{\infty} \frac{n}{2^n}$$

4

For each of the following series, determine whether it is absolutely convergent, conditionally convergent, or divergent.

$$\sum_{n=1}^{\infty} (-1)^{n+1} \sin \frac{\pi}{n} \quad \sum_{n=1}^{\infty} (-1)^n \frac{1}{n \ln n}$$

5

Compute the convergence set and the radius of convergence of the following power series.

$$1 + x + \frac{x^2}{\sqrt{2}} + \frac{x^3}{\sqrt{3}} + \frac{x^4}{\sqrt{4}} + \dots \quad \frac{x+5}{1 \cdot 2} + \frac{(x+5)^2}{2 \cdot 3} + \frac{(x+5)^3}{3 \cdot 4} + \frac{(x+5)^4}{4 \cdot 5} + \dots$$

6

Compute the Taylor polynomial of order 3 based at $\frac{\pi}{4}$ of the function $f(x) = \tan x$.

7

Use Maclaurin series to compute $f^{(16)}(0)$ for $f(x) = \cos(x^4 + x^8)$.

8

Compute the Maclaurin polynomial of order 4 of the function $f(x) = \sqrt{1 + \sin x}$.