Math 242: HW 11
Due on Thursday, July 31
Summer ’14

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Problem 1

Use the ratio test to show that \( \sum_{n=1}^{\infty} \frac{(2x)^n}{\sqrt{n}} \) converges absolutely for any \( x \in (-\frac{1}{2}, \frac{1}{2}) \) (note: this means that the radius of convergence is \( \frac{1}{2} \)). Now show the interval of convergence is \( [-\frac{1}{2}, \frac{1}{2}] \) by "checking the endpoints".

Problem 2

Use the root test to show that \( \sum_{n=2}^{\infty} (\ln(x))^n \) converges for any \( x \in (\frac{1}{e}, e) \). Now check the endpoints to show that the interval of convergence is \( (\frac{1}{e}, e) \). What is the radius of convergence?
Problem 3

Give the interval and radius of convergence of the following series (make sure to check the endpoints of the interval you get from the ratio/root test).

a) \( \sum_{n=1}^{\infty} \frac{x^n}{\sqrt{n^2 + 3}} \)

b) \( \sum_{n=1}^{\infty} \frac{\sqrt{n}x^n}{3^n} \)

c) \( \sum_{n=1}^{\infty} \frac{(x^2 + 1)^n}{3^n} \)
d) $\sum_{n=1}^{\infty} \frac{(x)^n}{n(\ln(n))^2}$

e) $\sum_{n=1}^{\infty} \frac{(x - 5)^n}{n + 1}$

**Problem 4**

Find the Maclaurin series for $f(x) = 2^x$.

**Problem 5**

Find the Taylor series for $f(x) = e^x$ at $a = 2$. 