Math 143 Sample Midterm 1

Midterm 1 topics include: Taylor polynomials, Taylor's inequality for error bounds when using Taylor polynomials, Taylor series, geometric series, convergence tests (integral test, p-series, direct comparison test, limit comparison test, ratio test, root test, alternating series), approximating alternating series, radius and interval of convergence, multiplying series.

The exam is closed notes/resources. Be aware that I can see when students access Canvas, the course web site, and the videos.

These practice problems are similar to those found on the midterm. They will not be collected.

1. Approximate the value of $\displaystyle\sum_{n=2}^{\infty} \frac{(-1)^n n}{n^2+1}$ to within $1/10$ of the actual value.

2. By repeatedly taking derivatives, find the Taylor series for $1/(2x+3)$ centered at $x=-1$. What is the radius of convergence?

3. Do these series converge? Carefully show which test you are using.

a. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n 2^n}{n^n+3}$

b. $\displaystyle\sum_{n=0}^{\infty} \frac{5^n}{3^n+4^n}$

c. $\displaystyle\sum_{n=0}^{\infty} \frac{(2n)!}{(3n)!}$

d. $\displaystyle\sum_{n=2}^{\infty} (-1)^n \frac{\sqrt{n}}{2\sqrt{n}+1}$

4. Let $f(x)=\sqrt{5+2x}$. Find the degree 2 Taylor polynomial $y(x)$ for $f(x)$ centered at $x=0$ and then find a bound on the error when approximating $f(1)$ with $y(1)$.

5. Find the exact values of these series

a. $\displaystyle\sum_{n=2}^{\infty} (-1)^n \frac{2^n}{3^{n-1}}$

b. $\displaystyle\sum_{n=0}^{\infty} (-1)^n \frac{\pi^{2n}}{4^n(2n+1)!}$

6. Find the radius of convergence for these series:

a. $\displaystyle\sum_{n=1}^{\infty} \frac{4^n}{2^n+1} x^n$

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