TEXAS A&M UNIVERSITY
Math Learning Center

Math 152 - Spring 2024
Exam 3 Review
"Hands On Grades Up"
Monday, April 15, 6-8 PM
ZACH 442/440

PLEASE SCAN THE QR CODE BELOW

We will begin at 6PM. A problem will be displayed on the wall monitors. Collaborate with your table on how to solve each problem. If you have a question, raise your hand. At the end of a predetermined number of minutes, the solutions will be displayed on the table monitors. Feel free to take a picture of the solution, as the solutions are not posted. Be sure you write clearly in the free response questions, and justify each step with well written mathematics to avoid losing partial credit!

Problem 1. Determine whether the following series converge or diverge. Support your work by naming the test you applied to reach your conclusion, and verifying the conditions of the test is/are met, as shown in class.

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

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

c.) $\displaystyle\sum_{n=2}^{\infty} \frac{2 + \cos n}{n^3 + n^2 + 1}$

d.) $\sum_{n=1}^{\infty} \frac{n}{4n^2 + n + 1}$

Problem 2. Determine whether the following series converge absolutely, converge conditionally, or diverge. Support your work by naming the test you applied to reach your conclusion, and verifying the conditions of the test is/are met, as shown in class.

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

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

c.) $\displaystyle\sum_{n=1}^{\infty} \frac{\cos(2n)}{n^2}$

Problem 3. Let $S = \sum_{n=1}^{\infty} \frac{(-1)^n}{n^3}$. Using The Alternating Series Estimation Theorem, determine how many terms we must use to approximate S with error less than $\frac{1}{78}$.

Problem 4. Suppose we use the sixth partial sum to approximate the sum of the series $\sum_{n=1}^{\infty} \frac{n^3}{(-4)^n}$. Using The Alternating Series Estimation Theorem, what is an upper bound on the absolute value of the remainder?

Problem 5. Find the interval and radius of convergence for $\sum_{n=3}^{\infty} \frac{(2x-1)^n}{3^n\sqrt{n-1}}$.

Problem 6. Find the interval and radius of convergence for $\sum_{n=3}^{\infty}(5x-4)^n n!$.

Problem 7. Find a Maclaurin series for the following functions and the associated radius of convergence.

a.) $f(x) = \dfrac{x}{8 + 3x^2}$.

b.) $f(x) = \dfrac{x}{(1-x^2)^2}$.

c.) $f(x) = \int x^4 \arctan\left(\frac{x^2}{5}\right)\, dx.$ Hint: $\arctan x = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{2n+1}.$

Problem 8. Using a known Maculaurin Series, evaluate $\displaystyle\int_0^{0.1} e^{-x^2/3}\,dx$.

Problem 9. Find the Taylor Series for $f(x) = xe^x$ at $x = 1$.

Problem 10. Find the sum of the series $\sum_{n=2}^{\infty} \frac{(-1)^n (\pi)^{2n}}{36^n (2n)!}$.

Problem 11. What is the coefficient of $(x-4)^3$ in the Taylor Series for $f(x) = \ln(2x+1)$ centered at $a = 4$?

Problem 12. If $f(x) = \ln x$, find the second degree Taylor Polynomial centered at at $a = 3$.