TEXAS A&M UNIVERSITY
Math Learning Center

Math 152 - Spring 2023
"Hands On Grades Up"
Monday, March 20, 7-9 PM
ZACH 210

Exam 2 Review: Covering sections 7.2-11.2

PLEASE SCAN THE QR CODE BELOW

We will begin at 7PM. A problem will be displayed on the table 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 wall monitors. Feel free to take a picture of the solution, as the solutions are not posted.

This non solved problem set is posted at https://mlc.tamu.edu/Help-Services/Hands-on,-Grades-up.

(1) Evaluate $\int_0^{\pi/2} \sin^4 x \cos^3 x \, dx$.

(2) Find $\int \tan^6 x \sec^4 x \, dx$.

(3) Evaluate $\displaystyle\int_0^{\pi/6} \sin^2(5x)\,dx$.

(4) Using an appropriate trigonometric substitution, rewrite $\displaystyle\int_{2\sqrt{2}}^{4} \frac{\sqrt{x^2-4}}{x}\,dx$ as an equivalent integral in terms of θ and $d\theta$ only. Simplify the integrand, but do not evaluate the integral.

(5) Find $\displaystyle\int \frac{x^3}{(x^2+1)^{3/2}}\,dx$.

(6) Find $\displaystyle\int \frac{2x+12}{x^3+4x^2+4x}\,dx$.

(7) Evaluate $\int_0^2 \frac{x^2+3x+12}{(x+1)(x^2+4)}\,dx$.

(8) Evaluate $\displaystyle\int_1^\infty \frac{e^{-3/x}}{x^2}\,dx$ or show it diverges.

(9) Evaluate $\displaystyle\int_1^e \frac{1}{x(\ln x)^2}\,dx$ or show it diverges.

(10) Determine whether the improper integral $\displaystyle\int_1^\infty \frac{\sin(6x)+8}{\sqrt{x}+x^4}\,dx$ converges or diverges using The Comparison Theorem for Improper Integrals.

(11) Consider the sequence $\{a_n\} = \left\{-\frac{4}{3}, \frac{8}{9}, -\frac{16}{27}, \frac{32}{81}, \cdots\right\}$. Assume the pattern continues, and the sequence begins with $n = 1$. What is a_{401}?

(12) Consider the recursive sequence $a_1 = 4$ and $a_{n+1} = \dfrac{5}{6 - a_n}$.

(a) Find the first three terms of the sequence.

(b) Assuming the sequence is decreasing and bounded, determine if the sequence converges or diverges. If it converges, find the limit.

(13) Determine whether the sequence converges or diverges. If it converges, what value does it converge to, if it diverges, explain why.

(a) $a_n = \arcsin\left(\dfrac{2n-1}{5-4n}\right)$

(b) $a_n = \ln(3n+1) - 2\ln(n)$

(14) For the series $\sum_{n=1}^{\infty} a_n$, the n^{th} partial sum is given by $s_n = \cos\left(\frac{\pi}{n}\right)$.

(a) Find a_5

(b) Find $\sum_{n=1}^{\infty} a_n$

(c) What is $\lim_{n\to\infty} a_n$?

(15) Determine if the following series converges or diverges. If the series converges, find the sum. If it diverges, explain why.

(a) $\displaystyle\sum_{n=1}^{\infty}\left[\frac{1}{2^n}-\frac{1}{2^{n+1}}\right]$

(b) $\sum_{n=1}^{\infty} \frac{(-1)^n 2^{n+1}}{5 \cdot 3^{2n}}$

(c) $\sum_{n=1}^{\infty} \frac{(-3)^n + e^n}{7^{n-1}}$

(16) Determine if the following statements are true or false. If the statement is false, give a counter example, and if the answer is true, explain why.

(a) If a sequence is bounded, then it converges.

(b) If s_n is the sequence of partial sums for $\sum_{n=1}^{\infty} a_n$, and $\lim_{n\to\infty} s_n = 4$, then $\sum_{n=1}^{\infty} a_n$ converges.

(c) If $\sum_{n=1}^{\infty} a_n$ converges, then $\lim_{n\to\infty} a_n = 0$.

(d) If $\{a_n\}$ converges, then so does $\sum_{n=1}^{\infty} a_n$.

(17) Consider $\sum_{n=1}^{\infty} a_n$

(a) State the Test for Divergence.

(b) Give an example of a series that diverges by the Test for Divergence.

(c) Give an example of a series where the Test for Divergence fails.

(18) Consider $\sum_{n=1}^{\infty} a_n$. What is the difference between $\{a_n\}$ and $\{s_n\}$?