Instructor: Rosanna Pearlstein

Math 152 – Fall 2022
"Week-in-Review"

Exam2 WIR

Problem 1. Compute the integral $\int \frac{dx}{x^2\sqrt{x^2-1}}$.

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Problem 2. Compute the integral $\int_0^2 x^3\sqrt{x^2+4}dx$.

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Problem 3. Compute the integral $\int \sqrt{-x^2+6x+7}dx$.

Problem 4. Compute the integral $\int_2^3 \frac{x^3+1}{x^2(x-1)}$.

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Problem 5. Compute the integral $\int \frac{x+1}{x^2-4}$.

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Problem 6. Compute the integral $\int \frac{2x^2-x+4}{x^3+4x}$.

Problem 7. Compute the integral $\int_e^\infty \dfrac{dx}{x(\ln x)^2}$.

Problem 8. Compute the integral $\int_1^9 \frac{1}{\sqrt[3]{x-9}} dx$.

Problem 9. Compute the integral $\int_{-1}^{2} \frac{1}{x^4} dx$.

Problem 10. Determine whether the integral converges: $\int_1^\infty \frac{1}{x + e^{2x}} dx$.

Problem 11. Determine whether the integral converges: $\int_5^\infty \dfrac{x}{x^{3/2} - x - 1} dx$.

Problem 12. Determine whether the sequence converges (if it does, find the limit) $a_n = \ln(3n + 1) - \ln(4n^2)$.

Problem 13. Determine whether the sequence converges (if it does, find the limit) $a_n = (-1)^n \dfrac{n}{n+1}$.

Problem 14. Determine whether the sequence converges (if it does, find the limit) $a_n = (-1)^n \dfrac{n}{n^2+1}$.

Problem 15. Determine whether the sequence converges (if it does, find the limit) $a_n = \sqrt{n^2 - 8n} - n$.

Problem 16. Consider the recursive sequence defined by $a_1 = 2$, $a_{n+1} = 1 - \dfrac{1}{a_n}$. Find the first 5 terms of the sequence. Find the limit of the sequence, if it exists.

Problem 17. Given the recursive sequence below is increasing and bounded, find the limit. $a_1 = 2$, $a_{n+1} = 4 - \dfrac{3}{a_n}$.

Problem 18. Use the Test For Divergence to show the series diverges:

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

Explain why the Test for Divergence is inconclusive when applied to the series $\sum_{n=1}^{\infty} \sin\left(\frac{1}{n}\right)$.

Problem 19. Find the sum of the series: $\displaystyle\sum_{n=1}^{\infty}\left(\sin\frac{1}{n}-\sin\frac{1}{n+1}\right)$

Problem 20. Find the sum of the series: $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^2+2n}$.

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Problem 21. Find the sum of the series: $\sum_{n=1}^{\infty} 2\left(\frac{5}{7}\right)^{n-1}$.

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Problem 22. Find the sume of the series: $\sum_{n=1}^{\infty} \frac{3^{2n+1}}{10^n}$.

Problem 23. Determine whether the following series converges or diverges: $\sum_{n=2}^{\infty} \frac{(-1)^n}{\ln n}$.

Problem 24. Determine whether the following series converges or diverges: $\sum_{n=1}^{\infty} \frac{(-1)^n \sqrt{n}}{\sqrt{n+1}}$.

Problem 25. Determine whether the following series converges or diverges: $\sum_{n=2}^{\infty} \frac{(-1)^n}{3n-1}$.

Problem 26. Determine whether the following series converges or diverges: $\sum_{n=1}^{\infty} \frac{(-1)^n n}{n^3+1}$.

Problem 27. Determine whether the following series converges or diverges: $\displaystyle\sum_{n=1}^{\infty} \frac{\cos\left(\frac{1}{n}\right)}{n^2}$.

Problem 28. Determine whether the following series converges or diverges: $\sum_{n=1}^{\infty} \frac{(-10)^n n!}{(2n+1)!}$

In the problem below, the "-1" is a typo, we will solve replacing "-1" by "+1".

Problem 29. Consider the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^5}$. Use the first 5 terms to estimate the sum. Estimate the error in the approximation s_5 to the sum of the series. How many terms do you need to take in order to ensure an approximation to within .01?