Calculus 2
Fall 2023

Homework

Chapter 1

Week 1

1. Consider the following sequence $\{a_n\}$ with the few first terms given as

$$\{-\frac{1}{2}, \frac{16}{3}, -\frac{81}{4}, \frac{256}{5}, -\frac{625}{6}, ...\}$$

Find a formula for the general term a_n.

2. If \$600 is invested at 4% interest, compounded annually. Find the size of investment after 7 years.

3. Determine the limits of the following sequences

a) $a_n = \frac{3n^3}{n^3+1}$

b) $b_n = \left(\frac{5+n}{n}\right)^n$

c) $c_n = n^{1/n}$

d) $d_n = \ln(n^3 + 1) - \ln(3n^3 + 10n)$

4. Using squeeze Theorem find the limit of the sequence

$$a_n = \frac{\sin(2n)}{2^n}$$

Week 2

1. Check the following series if the series is convergent or divergent

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

b) $\sum_{n=1}^{\infty} \frac{3}{n^2+7n+12}$

2 Using integral test to check the following series if the series converges or diverges.

a) $\sum_{n=1}^{\infty} \frac{1}{n^{\pi}}$

b) $\sum_{n=0}^{\infty} \frac{2}{5n+3}$

c) $\sum_{n=0}^{\infty} \frac{n^2}{n^3+1}$

d) $\sum_{n=0}^{\infty} \frac{1}{n^2+4}$

3. Using the Divergence Test to determine if the following series diverges or conclude that the Divergence Test is inconclusive

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

b) $\sum_{n=1}^{\infty} \frac{1}{n^2}$

c) $\sum_{n=2}^{\infty} \frac{n}{\ln(n)}$

4. Using comparison test or limit comparison test to determine if the following series diverges or converges

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

b) $\sum_{n=1}^{\infty} \frac{4}{n^2-2n-3}$

c) $\sum_{n=1}^{\infty} \frac{n^3}{2n^4-1}$

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

5. Determine whether the following series converges or diverges

a) $\sum_{n=1}^{\infty} \sqrt{\frac{n+1}{n}}$

b) $\sum_{n=0}^{\infty} \frac{10}{n^2+9}$

c) $\sum_{n=2}^{\infty} \frac{4}{n\ln^2(n)}$

6 Consider the series

$$\sum_{n=2}^{\infty} \frac{1}{n \ln^p(n)}$$

where p is a real number.

i) Using the integral test to determine the value of p for which the series converges

ii) Does the series converge faster for $p = 2$ or $p = 3$? Explain.