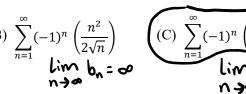
Mid-Unit 10 Review - Infinite Sequences and Series

Reviews do NOT cover all material from the lessons but will hopefully remind you of key points. To be prepared, you must study all packets from Unit 10.

1. Which of the following series converges?



1. Which of the following series converges? Use Alternating series Test

(A)
$$\sum_{n=1}^{\infty} (-1)^n \left(\frac{n+3}{3n}\right)$$
 (B) $\sum_{n=1}^{\infty} (-1)^n \left(\frac{n^2}{2\sqrt{n}}\right)$ (C) $\sum_{n=1}^{\infty} (-1)^n \left(\frac{2\sqrt{n}}{n}\right)$ (D) $\sum_{n=1}^{\infty} (-1)^n \left(\frac{4-n}{n}\right)$ Lim $b_n = 0$ $n \to \infty$ $b_n = -1$

bn is decreasing

2. What is the value of $\sum_{n=1}^{\infty} \frac{2^{n+1}}{7^n}$? $=\sum_{n=1}^{\infty} \frac{2^n \cdot \lambda}{7^n} =\sum_{n=1}^{\infty} 2 \cdot (\frac{\lambda}{2})^n =\frac{\alpha \cdot r}{1-r}$

Which of the following series can be used with the Limit Comparison Test to determine whether the series $\sum_{n=0}^{\infty} \frac{2^n}{3^n - n^2}$ converges or diverges?

$$\frac{2}{3}^{\circ} = \left(\frac{2}{3}\right)^{\circ}$$

- (A) $\sum_{n=0}^{\infty} \left(\frac{3}{2}\right)^n$
- (B) $\sum_{n=0}^{\infty} \frac{1}{3^n}$
- (D) $\sum_{n=0}^{\infty} \frac{1}{n}$
- 4. Calculator active. Find the sequence of partial sums S_1 , S_2 , S_3 , S_4 , and S_5 for the infinite series $\sum_{n=1}^{\infty} \frac{3}{2^{n-1}}.$ $S_4 = \frac{3}{2^3} + S_3 = \boxed{5.625}$

$$5_{1} = \frac{3}{3^{2}} = 3$$

$$5_{2} = \frac{3}{3} + 5_{1} = \frac{4.5}{5.25}$$

$$5_{3} = \frac{3}{3^{2}} + 5_{2} = 5.25$$

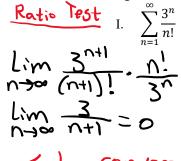
$$5_4 = \frac{3}{2} + 5_3 = 5.625$$

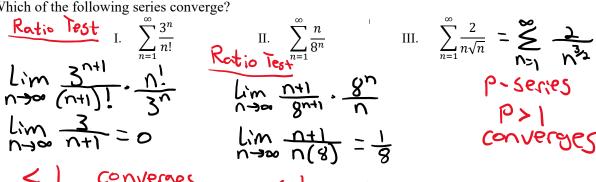
$$5_5 = \frac{3}{24} + 5_4 = 5.8125$$

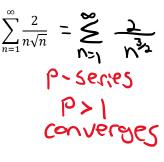
5. Verify that the infinite series $\sum_{n=0}^{\infty} \frac{3^n + 1}{3^{n+2}}$ diverges by using the *n*th-Term Test for Divergence. Show the value

$$\lim_{N\to\infty} \frac{3^2 \cdot 3^n}{3^2 \cdot 3^n} = \frac{1}{\sqrt{3}} \neq 0$$
Diverges

6. Which of the following series converge?

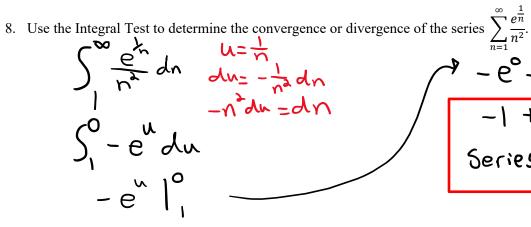






< 1 converges

- (A) I only
- (B) I and II only
- (C) I and III only
- (D) I, II, and III
- 7. For what values of x is the series $\sum_{n=1}^{\infty} \frac{(x+2)^n}{n} \text{ conditionally convergent?}$ $\lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{(x+2)^n} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{(x+2)^n} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{n+1} \cdot \frac{n}{n+1} \right| \leq \lim_{n \to \infty} \left| \frac{n}{$ |X+2 | < | Harmonic diverges (B) x = -3(A) x > -1(C) x = -1(D) x = 3



9. Which of the following series converge?

- II. $\sum_{n=1}^{\infty} \left(\frac{2}{3}\right)^{n}$ III. $\sum_{n=2}^{\infty} \frac{1}{n \ln n}$ Geometric $1 + \sum_{n=2}^{\infty} \frac{1}{n \ln n}$ The gral Test $1 + \sum_{n=2}^{\infty} \frac{1}{n \ln n}$ Converges $1 + \sum_{n=2}^{\infty} \frac{1}{n \ln n}$ $1 + \sum_{n=2}^{\infty} \frac{1}{n \ln$ ln(00) - ln[in] Diverges

- (A) I only
- (B) II only
- (C) III only
- (D) I and II only
- (E) I, II, and III
- 10. Which of the following statements about the series $\sum_{n=1}^{\infty} \frac{3}{1+2^n}$ is true? $\sum_{n\to\infty} \infty = 0$

$$\begin{array}{c}
 1 + 2^n \\
 1 - 3 \\
 1 - 3
 \end{array}$$

X (A) Diverges by the *n*th Term test.

(B) Diverges by comparison to $\sum_{n=1}^{\infty} \frac{1}{2^n}$.



- (C) Converges by comparison to $\sum_{n=1}^{\infty} \frac{1}{2^n}$.
- (D) Diverges by comparison to $\sum_{n=0}^{\infty} \frac{1}{n}$
- $b_n = \frac{1}{2^n}$ $0 \le \alpha_n \le b_n$ $\sum_{n=1}^{\infty} b_n$ converses. Geometric Serves

Alternative
$$\frac{(-1)^{n+1}n}{n^2+3}$$
 is true?

- 11. Which of the following statements about the series $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}n}{n^2 + 3}$ is true? $b_n = \frac{n}{n^2 + 3}$ $b_n = \frac{n}{n^2 + 3}$ $b_n = 0$ is decreasing.
 - (B) The series diverges by limit comparison with $\sum \frac{1}{n}$.
 - (C) The series converges by comparison with $\sum_{n=1}^{\infty} \frac{1}{n^2}$.
 - (D) The series converges by the Alternating Series Test.

- 12. Which of the following is required in order to apply the Integral Test to the series $\sum a_n$?
 - (A) $\lim_{n\to\infty} a_n = 0$ and $\sum_{n\to\infty} a_n$ is a positive series.
 - (B) $\lim_{n\to\infty} a_n \neq 0$ and $\sum_{n\to\infty} a_n$ is a convergent series.
 - (C) $a_n = f(n)$ and f(x) is positive, continuous, and increasing on $[1, \infty)$.
 - (D) $a_n = f(n)$ and f(x) is positive, continuous, and decreasing on $[1, \infty)$
- 13. If $a_n > 0$ for all n and $\lim_{n \to \infty} \frac{a_{n+1}}{a_n} = \frac{2}{3}$, which of the following series converges?
- (A) $\sum 3^n a_n$

- (A) $\sum_{n=1}^{\infty} 3^{n} a_{n}$ (B) $\sum_{n=1}^{\infty} \frac{2^{n}}{a_{n}}$ (C) $\sum_{n=1}^{\infty} a_{n} \left(\frac{7}{2}\right)^{n}$ (D) $\sum_{n=1}^{\infty} \frac{(a_{n})^{2}}{3^{n}}$ $\frac{3^{n+1}}{3^{n}} a_{n+1}$ $\frac{2^{n+1}}{3^{n}} a_{n}$ $\frac{2^{n+1}}{3^{n}} a_{n}$
 - 2 > 1, Diverges 3 > 1, diverges 3 > 1, diverges 3 > 1, diverges
- 14. The infinite series $\sum_{n=0}^{\infty} \frac{1}{7^{n+1}}$ has nth partial sum $S_n = \frac{1}{6} \left(\frac{1}{7} \frac{1}{7^{n+1}} \right)$ for $n \ge 1$. What is the sum of the series?

15. For what value of r does the infinite series $\sum_{n=1}^{\infty} 10r^n$ equal 22?

$$\frac{-17 = -75L}{10 = 77 - 79L}$$

16.	Determine whether	ľ
_	Abs 1	

$$s \sum_{n=0}^{\infty} \frac{\sin\left[\frac{(2n-1)n}{2}\right]}{n}$$
 converges absolutely, converges conditionally, or diverges.

er the series
$$\sum_{n=1}^{\infty} \frac{\sin\left[\frac{(2n-1)\pi}{2}\right]}{n}$$
 converges absolutely, converges conditionally, or diverges. Sin($\frac{3\pi}{2}$), Sin($\frac{3\pi}{$

Alt. Series Test with
$$b_n = \frac{1}{n}$$

Lim $b_n = 0$ b_n is decre

17. Determine the convergence of the infinite *p*-series $\sum_{n=0}^{\infty} n^{-\pi}$.

onversent p-series

18. The nth-Term Test can be used to determine divergence for which of the following series?

$$I. \quad \sum_{n=1}^{\infty} \frac{2}{n+1}$$

I.
$$\sum_{n=1}^{\infty} \frac{2}{n+1}$$
 II. $\sum_{n=1}^{\infty} (-1)^{n+1} \left(\frac{n}{4n+1}\right)$ III. $\sum_{n=1}^{\infty} \frac{n(n-2)^2}{3n^3+1}$

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

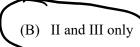
I.
$$\sum_{n=1}^{2} \frac{2}{n+1}$$
II.
$$\sum_{n=1}^{\infty} (-1)^{n+1} \left(\frac{n}{4n+1}\right)$$
III.
$$\sum_{n=1}^{\infty} \frac{n(n-2)}{3n^3+1}$$

$$\lim_{n \to \infty} \alpha_n = 0$$

$$\lim_{n \to \infty} 1 + \frac{1}{4}$$

$$\lim_{n \to \infty} \alpha_n = \frac{1}{3}$$





- (C) I and III only (D) I, II, and III