(1 point) The three series $\sum A_n$, $\sum B_n$, and $\sum C_n$ have terms

$$A_n = \frac{1}{n^7}, \quad B_n = \frac{1}{n^2}, \quad C_n = \frac{1}{n}.$$

Use the Limit Comparison Test to compare the following series to any of the above series. For each of the series below, you must enter two letters. The first is the letter (A,B, or C) of the series above that it can be legally compared to with the Limit Comparison Test. The second is C if the given series converges, or D if it diverges. So for instance, if you believe the series converges and can be compared with series C above, you would enter CC; or if you believe it diverges and can be compared with series A, you would enter AD.

1. $\sum_{n=1}^{\infty} \frac{2n^2 + n^7}{1496n^9 + 7n^2 + 3}$
2. $\sum_{n=1}^{\infty} \frac{6n^6 + n^2 - 6n}{7n^{13} - 3n^9 + 8}$
3. $\sum_{n=1}^{\infty} \frac{3n^2 + 6n^6}{2n^7 + 7n^3 - 2}$

(1 point) Test each of the following series for convergence by either the Comparison Test or the Limit Comparison Test. If at least one test can be applied to the series, enter CONV if it converges or DIV if it diverges. If neither test can be applied to the series, enter NA. (Note: this means that even if you know a given series converges by some other test, but the comparison tests cannot be applied to it, then you must enter NA rather than CONV.)

1. $\sum_{n=1}^{\infty} \frac{(-1)^n}{9n}$
2. $\sum_{n=1}^{\infty} \frac{6n^5 - n^3 + 4\sqrt{n}}{9n^7 - n^2 + 5}$
3. $\sum_{n=1}^{\infty} \frac{\cos(n)\sqrt{n}}{4n + 6}$
4. $\sum_{n=1}^{\infty} \frac{4n^2}{n^5 + 6}$
5. $\sum_{n=1}^{\infty} \frac{4n^2}{n^3 + 6}$

(1 point) Select the FIRST correct reason why the given series converges.

A. Convergent geometric series
B. Convergent p series
C. Comparison (or Limit Comparison) with a geometric or p series
D. Converges by alternating series test

1. $\sum_{n=1}^{\infty} \frac{4(7)^n}{11^{2n}}$
2. $\sum_{n=1}^{\infty} \frac{(-1)^n \ln(e^n)}{n^7 \cos(n\pi)}$
3. $\sum_{n=1}^{\infty} \frac{\cos(n\pi)}{\ln(2n)}$
4. $\sum_{n=1}^{\infty} \frac{\sin^2(7n)}{n^2}$
5. $\sum_{n=1}^{\infty} (-1)^n \frac{\sqrt{n}}{n + 1}$
6. $\sum_{n=1}^{\infty} \frac{(n + 1)(80)^n}{9^{2n}}$

(1 point) Select the FIRST correct reason why the given series converges.

A. Convergent geometric series
B. Convergent p series
C. Comparison (or Limit Comparison) with a geometric or p series
D. Converges by alternating series test

1. $\sum_{n=1}^{\infty} (-1)^n \frac{\sqrt{n}}{n+2}$
2. $\sum_{n=1}^{\infty} \frac{\sin^2(4n)}{n^2}$
3. $\sum_{n=1}^{\infty} \frac{(-1)^n}{2n+5}$
4. $\sum_{n=1}^{\infty} \frac{n^2+\sqrt{n}}{n^4-2}$
5. $\sum_{n=1}^{\infty} \frac{\cos(n\pi)}{\ln(4n)}$
6. $\sum_{n=1}^{\infty} \frac{(8)^n}{3^{2n}}$

(1 point) Select the FIRST correct reason why the given series diverges.

A. Diverges because the terms don't have limit zero
B. Divergent geometric series
C. Divergent p series
D. Integral test
E. Comparison with a divergent p series
F. Diverges by limit comparison test
G. Cannot apply any test done so far in class

1. $\sum_{n=2}^{\infty} \frac{1}{n\ln(n)}$
2. $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}}$
3. $\sum_{n=1}^{\infty} \frac{\ln(n)}{n}$
4. $\sum_{n=1}^{\infty} (n)^{-\frac{1}{5}}$
5. $\sum_{n=1}^{\infty} \frac{5n+5}{(-1)^n}$
6. $\sum_{n=1}^{\infty} (-1)^n \frac{(2n)!}{(n!)^2}$

(1 point) Consider the series $\sum_{n=1}^{\infty} a_n$ where

$$a_n = \frac{8^n}{(6n^2 + 1)11^{n+4}}$$

In this problem you must attempt to use the Ratio Test to decide whether the series converges.

Compute

$$L = \lim_{n \to \infty} \left| \frac{a_{n+1}}{a_n} \right|$$

Enter the numerical value of the limit L if it converges, INF if it diverges to infinity, MINF if it diverges to negative infinity, or DIV if it diverges but not to infinity or negative infinity.

$L =$ [ ]

Which of the following statements is true?

A. The Ratio Test says that the series converges absolutely.
B. The Ratio Test says that the series diverges.
C. The Ratio Test says that the series converges conditionally.
D. The Ratio Test is inconclusive, but the series converges absolutely by another test or tests.
E. The Ratio Test is inconclusive, but the series diverges by another test or tests.
F. The Ratio Test is inconclusive, but the series converges conditionally by another test or tests.

Enter the letter for your choice here: ?

(1 point) Match each of the following with the correct statement.

A. The series is absolutely convergent.
C. The series converges, but is not absolutely convergent.
D. The series diverges.

[ ] **1.** $\sum_{n=1}^{\infty} \frac{\sin(6n)}{n^2}$

[ ] **2.** $\sum_{n=1}^{\infty} (-1)^n \frac{\sqrt{n}}{n+3}$

[ ] **3.** $\sum_{n=1}^{\infty} \frac{(-7)^n}{n^4}$

[ ] **4.** $\sum_{n=1}^{\infty} \frac{(n+1)(8^2-1)^n}{8^{2n}}$

[ ] **5.** $\sum_{n=1}^{\infty} \frac{(-1)^n}{4n+3}$

(1 point)

Apply the Ratio Test to determine convergence or divergence, or state that the Ratio Test is inconclusive.

$$\sum_{n=1}^{\infty} \frac{1}{n \ln n}$$

$\rho = \lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| =$ [ ] (Enter 'inf' for ∞.)

$\sum_{n=1}^{\infty} \frac{1}{n \ln n}$ is:

○ **A.** convergent ○ **B.** divergent ○ **C.** The Ratio Test is inconclusive

(1 point)

Apply the Ratio Test to determine convergence or divergence, or state that the Ratio Test is inconclusive.

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

$\rho = \lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| =$ [ ] (Enter 'inf' for ∞.)

$\sum_{n=1}^{\infty} \frac{(n!)^2}{(2n)!}$ is:

○ **A.** convergent ○ **B.** divergent ○ **C.** The Ratio Test is inconclusive

(1 point)

Apply the Ratio Test to determine convergence or divergence, or state that the Ratio Test is inconclusive.

$$\sum_{n=1}^{\infty} \frac{n^6}{6^{n^5}}$$

$\rho = \lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| =$ [ ] (Enter 'inf' for ∞.)

$\sum_{n=1}^{\infty} \frac{n^6}{6^{n^5}}$ is:

○ **A.** convergent ○ **B.** divergent ○ **C.** The Ratio Test is inconclusive

(1 point)

Apply the Ratio Test to determine convergence or divergence, or state that the Ratio Test is inconclusive.

$$\sum_{n=1}^{\infty} \frac{11^n}{4^{n^4}}$$

$\rho = \lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| =$ ______ (Enter 'inf' for ∞.)

$\sum_{n=1}^{\infty} \frac{11^n}{4^{n^4}}$ is:

- **A.** convergent
- **B.** divergent
- **C.** The Ratio Test is inconclusive

(1 point) Consider the series $\sum_{n=1}^{\infty} (-1)^n \frac{n^2 2^n}{n!}$. Evaluate the the following limit. If it is infinite, type "infinity" or "inf". If it does not exist, type "DNE".

$$\lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| = L$$

Answer: $L =$ ______

What can you say about the series using the Ratio Test? Answer "Convergent", "Divergent", or "Inconclusive".

Answer: choose one

Determine whether the series is *absolutely convergent, conditionally convergent,* or *divergent*. Answer "Absolutely Convergent", "Conditionally Convergent", or "Divergent".

Answer: choose one

(1 point) Consider the series $\sum_{n=1}^{\infty} \frac{3^n n!}{n^n}$. Evaluate the the following limit. If it is infinite, type "infinity" or "inf". If it does not exist, type "DNE".

$$\lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| = L$$

Answer: $L =$ ______

What can you say about the series using the Ratio Test? Answer "Convergent", "Divergent", or "Inconclusive".

Answer: choose one

Determine whether the series is *absolutely convergent, conditionally convergent,* or *divergent*. Answer "Absolutely Convergent", "Conditionally Convergent", or "Divergent".

Answer: choose one

(1 point) Use the ratio test to determine whether $\sum_{n=19}^{\infty} \frac{7^n}{(2n)!}$ converges or diverges.

(a) Find the ratio of successive terms. Write your answer as a fully simplified fraction. For $n \geq 19$,

$$\lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| = \lim_{n\to\infty} \frac{\square}{\square}$$

(b) Evaluate the limit in the previous part. Enter ∞ as *infinity* and $-\infty$ as *-infinity*. If the limit does not exist, enter *DNE*.

$\lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| =$ [ ]

(c) By the ratio test, does the series converge, diverge, or is the test inconclusive? [Choose]

(1 point)

Use the Root Test to determine the convergence or divergence of the given series or state that the Root Test is inconclusive.

$$\sum_{n=1}^{\infty} \left(\frac{n}{n+12}\right)^n$$

$L = \lim_{n\to\infty} \sqrt[n]{|a_n|} =$ [ ] (Enter 'inf' for ∞.)

$\sum_{n=1}^{\infty} \left(\frac{n}{n+12}\right)^n$ is:

○ **A.** convergent ○ **B.** divergent ○ **C.** The Root Test is inconclusive

(1 point) Consider the series $\sum_{n=1}^{\infty} \left(\frac{3n-1}{6n+3}\right)^{2n}$. Evaluate the the following limit. If it is infinite, type "infinity" or "inf". If it does not exist, type "DNE".

$$\lim_{n\to\infty} \sqrt[n]{|a_n|} = L$$

Answer: $L =$ [ ]

What can you say about the series using the Root Test? Answer "Convergent", "Divergent", or "Inconclusive".

Answer: [choose one]

Determine whether the series is *absolutely convergent, conditionally convergent,* or *divergent.* Answer "Absolutely Convergent", "Conditionally Convergent", or "Divergent".

Answer: [choose one]
