

1.

Determine the limit of the sequence

$$a_n = \left(1 + \frac{-8}{5n^2}\right)^{5n^2}$$

2.

Determine whether the following series converges or diverges. If it converges, find its sum.

$$\frac{1}{e^2} - \frac{2\pi}{e^5} + \frac{4\pi^2}{e^8} - \frac{8\pi^3}{e^{11}} + \dots$$

3.

Determine whether the following series converges or diverges. If it converges, find its sum.

$$\sum_{n=1}^{\infty} \left( \arccos\left(\frac{\sqrt{3}}{n+1}\right) - \arccos\left(\frac{\sqrt{3}}{n+2}\right) \right)$$

4.

Determine whether the following series converges or diverges.

I.  $\sum_{n=1}^{\infty} \left( n - \sqrt{n^2 - 5n} \right)$

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

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5.

Determine whether the following series converges or diverges.

I. 
$$\sum_{n=1}^{\infty} \left( \ln \left( \sqrt{e} + \frac{1}{n} \right) \right)^{n+1}$$

II. 
$$\sum_{n=1}^{\infty} \frac{n^{\sqrt{3}}}{e^{n+4} 5^n}$$

6.

Determine whether the following series converges or diverges.

I. 
$$\sum_{n=1}^{\infty} \frac{1}{n(1 + (\ln n)^2)}$$

II. 
$$\sum_{n=1}^{\infty} \frac{1}{2\sqrt[3]{n} - \sqrt[5]{n}}$$

7.

Determine whether the following series is absolutely convergent, conditionally convergent or divergent.

I. 
$$\sum_{n=2}^{\infty} \frac{(-1)^n \ln n}{n^{3/4}}$$

II. 
$$\sum_{n=1}^{\infty} \frac{(n+2)!}{e^{n^2}}$$

**Answers:**

1.  $e^{-8}$

4. I. Diverges II. Converges

2.  $\frac{e}{e^3 + 2\pi}$

5. I. Converges II. Converges

3.  $\frac{-\pi}{3}$

6. I. Converges II. Diverges

7. I. Conditionally Convergent II. Absolutely Convergent