

We have seen many different methods for testing a series for convergence. The methods we have learned are: Divergence Test, Geometric Series, p-Series, Integral Test, Comparison Test, Limit Comparison Test, Absolute Convergence, Alternating Series Test, Ratio Test, and Root Test. If you put these techniques in your favorite order and proceeded to try the tests in order for each problem on your midterm, you would run out of time before you finished half of the problems. We need a better decision making process for determining which methods to use.

I. Self-examination of strategies for determining series convergence.

Determine whether each of the following series convergent or divergent. Be careful to show all of your steps. After you determine whether a series converges or diverges, **write a brief explanation (at least one full sentence)** of why you chose to use the test that you used. If you tried any other tests before finding one that worked, **name any other tests attempted and describe how they failed**.

1)
$$\sum_{n=1}^{\infty} \frac{n^2 2^{n-1}}{(-5)^n}$$

2)
$$\sum_{n=1}^{\infty} n^2 e^{-n^3}$$

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

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

5)
$$\sum_{n=1}^{\infty} \tan\left(\frac{1}{n}\right)$$

6)
$$\sum_{n=1}^{\infty} \frac{e^{1/n}}{n^2}$$

7)
$$\sum_{n=1}^{\infty} \frac{n!}{e^{n^2}}$$

8)
$$\sum_{n=1}^{\infty} \frac{5^n}{3^n + 4^n}$$

9)
$$\sum_{n=1}^{\infty} (-1)^n \frac{\sqrt{n}}{n + 5}$$

10)
$$\sum_{n=1}^{\infty} \left(\frac{n}{n + 3} \right)^{n^2}$$

11)
$$\sum_{n=1}^{\infty} \frac{1}{n + n \cos^2 n}$$

12)
$$\sum_{n=2}^{\infty} (\sqrt[n]{2} - 1)^n$$