

Too Many Absolutes!!

If you are like a lot of students, you are wondering about all the times you are looking at the words “absolute convergence” in different contexts, and maybe getting them confused. Let’s try to make sure we have this clear in our minds.

With a power series:

If you are given a power series and asked to find the interval of convergence we sometimes hear the phrase “absolute convergence”. In this context, it refers to that first interval of convergence that we find by using the ratio or root test. The limit of our ratio or root is put between -1 and 1 (because with either the root or ratio tests, we know the series converges when $p < 1$) and we solve the inequality to find the interval of convergence. Because the power series will converge for absolutely every value of x within that interval, we can say that the series converges absolutely within that interval. That interval is our interval of absolute convergence. Then we check the endpoint series to find the complete interval of convergence.

With an alternating series:

When we have an alternating series, absolute convergence refers to whether or not a series that is identical except that it only has positive terms would converge. If it does, our alternating series also converges, and we say that it converges absolutely. It is when the series of absolute values of terms converges.

If the all-positive termed series does not converge, then we go back to the alternating series and test it with the Alternating Series Test (AST). If it converges, it is said to converge conditionally. In other words, it converges, but only on the condition that we alternate the signs between terms in the series.