Does $\sum_{n=1}^{\infty} \frac{1}{2^n}$ diverge, converge absolutely, or converge conditionally?

Solution

$\sum_{n=1}^{\infty} \frac{1}{2^n}$ is a geometric series with common ratio $r = \frac{1}{2}$. Therefore, the series $\sum_{n=1}^{\infty} \frac{1}{2^n}$ converges by the Geometric Series Test.

Since $\sum |a_n| = \sum a_n$, the series $\sum_{n=1}^{\infty} \frac{1}{n^2}$ converges absolutely.