Differentiate the Difference

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Riemann sums are a way of understanding integrals. Riemann sums have practical applications as they can be used to measure areas such as a lake easier than other methods. However, Riemann sums give an approximation of area compared to integrals that give exact area. In this experiment, I tested the difference between the four Riemann sums and the definite integral. For each equation tested, I found the definite integral on the intervals [-5, 0] and [0, 5]. For each interval, I also calculated each of the four Riemann sums. I put each sum against the actual area to find percent error for each. The equations were divided into 5 groups: linear, monomials, polynomials, exponentials, and radicals. All were randomly generated to prevent bias. There was an overall average percent error then a percent error average for each interval. Left and Right Sums had around the same percent error for each group. Trapezoidal and mid sums were more accurate than left and right. When comparing the negative and positive interval, there was more error on the positive. In the negative interval, trapezoidal had the least percent error overall. Exponential had a high percent error in the negative and positive interval for all sums. Overall, middle had the lowest percent error average, going against my original hypothesis that trapezoidal would be the best way to estimate area.