Attention deficit hyperactivity disorder is a neurodevelopmental condition associated with varying levels of hyperactivity, inattention, and impulsivity. This study investigates brain function in children with attention deficit hyperactivity disorder using measures of nonlinear dynamics in EEG signals during rest. During eyes-closed resting, 19 channel EEG signals were recorded from 12 ADHD and 12 normal age-matched children. We used the multifractal singularity spectrum, the largest Lyapunov exponent, and approximate entropy to quantify the chaotic nonlinear dynamics of these EEG signals. As confirmed by Wilcoxon rank sum test, largest Lyapunov exponent over left frontal-central cortex exhibited a significant difference between ADHD and the age-matched control groups. Further, mean approximate entropy was significantly lower in ADHD subjects in prefrontal cortex. The singularity spectrum was also considerably altered in ADHD compared to control children. Evaluation of these features was performed by two classifiers: a Support Vector Machine and a Radial Basis Function Neural Network. For better comparison, subject classification based on frequency band power was assessed using the same types of classifiers. Nonlinear features provided better discrimination between ADHD and control than band power features. Under four-fold cross validation testing, support vector machine gave 83.33% accurate classification results.