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## Anderson–Darling statistic and its “inverse”

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For more than 60 years, Anderson-Darling statistic is one of the most popular in applications among the Cramér-von-Mises goodness-of-fit tests. This statistic modifies the classical empirical process in the interval  $[0, 1]$  by multiplying it by a weighting function  $w(x) = (x(1-x))^{-\alpha}$ . The weighting function redistributes the test sensitivity to deviations of the alternative distribution function from the hypothetical on different subsets of  $[0, 1]$ . In practice, the tests can be of interest having other weight functions. The paper proposes new formulas for eigen functions of the Anderson-Darling statistics. Also, it was analyzed as statistic “inverse” to the Anderson-Darling statistic with the weighting function  $w(x) = (x(1-x))^{-\beta}$ . This was considered also as another weighting function. The proposed theory is based on the use of various special functions. In practice, it could be useful for the Cramér-von-Mises tests with weighting functions from the family  $w(x) = (x(1-x))^{-\beta}$ ,  $\alpha > -1$ ,  $\beta > -1$ . The paper contains a table of distribution for these statistics with different values of the degrees  $\alpha > -1$  and  $\beta > -1$ . The table was calculated by different methods with good precision without using the statistical simulation.

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