mean square deviation

Canonical name	MeanSquareDeviation
Date of creation	2013-03-22 18:21:57
Last modified on	2013-03-22 18:21:57
Owner	pahio (2872)
Last modified by	pahio (2872)
Numerical id	8
Author	pahio (2872)
Entry type	Definition
Classification	msc 26A06
Classification	msc 41A99
Classification	msc 26A42
Synonym	mean squared error
Related topic	Variance
Related topic	RmsError
Related topic	AverageValueOfFunction

If f is a Riemann integrable real function on the interval $[a,\,b]$ which is wished to be approximated by another function φ with the same property, then the `http://planetmath.org/MeanValueTheorem`mean

$$m \;=\; \frac{1}{b-a}\int_a^b [f(x)-\varphi(x)]^2\,dx$$

is called the *mean square deviation* of φ from f.

For example, if $\sin x$ is approximated by x on $[0,\,\frac{\pi}{2}]$, the mean square deviation is

$$\frac{2}{\pi}\int_0^{\frac{\pi}{2}} (\sin x - x)^2\,dx \;\approx\; 0.04923.$$

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