



Math for the people, by the people.

## reverse Markov inequality

Canonical name	ReverseMarkovInequality
Date of creation	2013-03-22 17:48:08
Last modified on	2013-03-22 17:48:08
Owner	kshum (5987)
Last modified by	kshum (5987)
Numerical id	6
Author	kshum (5987)
Entry type	Definition
Classification	msc 60A99
Related topic	MarkovsInequality

Let  $X$  be a random variable that satisfies  $\Pr(X \leq a) = 1$  for some constant  $a$ . Then, for  $d < E[X]$ ,

$$\Pr(X > d) \geq \frac{E[X] - d}{a - d}$$

*Proof:* Apply the Markov's inequality to the random variable  $\tilde{X} = a - X$ ,

$$\Pr(X \leq d) = \Pr(\tilde{X} \geq a - d) \leq \frac{E[\tilde{X}]}{a - d} = \frac{a - E[X]}{a - d}.$$

Hence

$$\Pr(X > d) \geq 1 - \frac{a - E[X]}{a - d} = \frac{E[X] - d}{a - d}.$$