

MATH 243 PARTIAL LECTURE NOTES (4 APRIL 2008)

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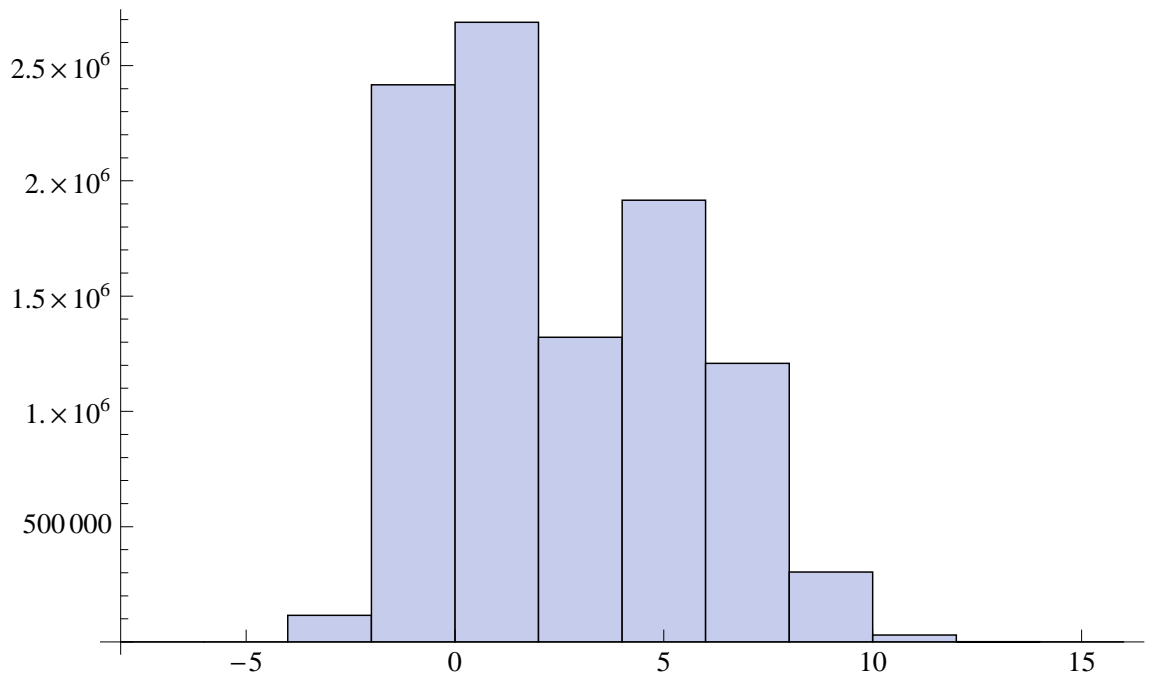
1. DENSITY CURVES AND THE NORMAL DISTRIBUTION

From histograms to density curves.

The total area of a histogram is equal to the class width times the number of data points. For a density curve, *rescale* so that the total area is one.

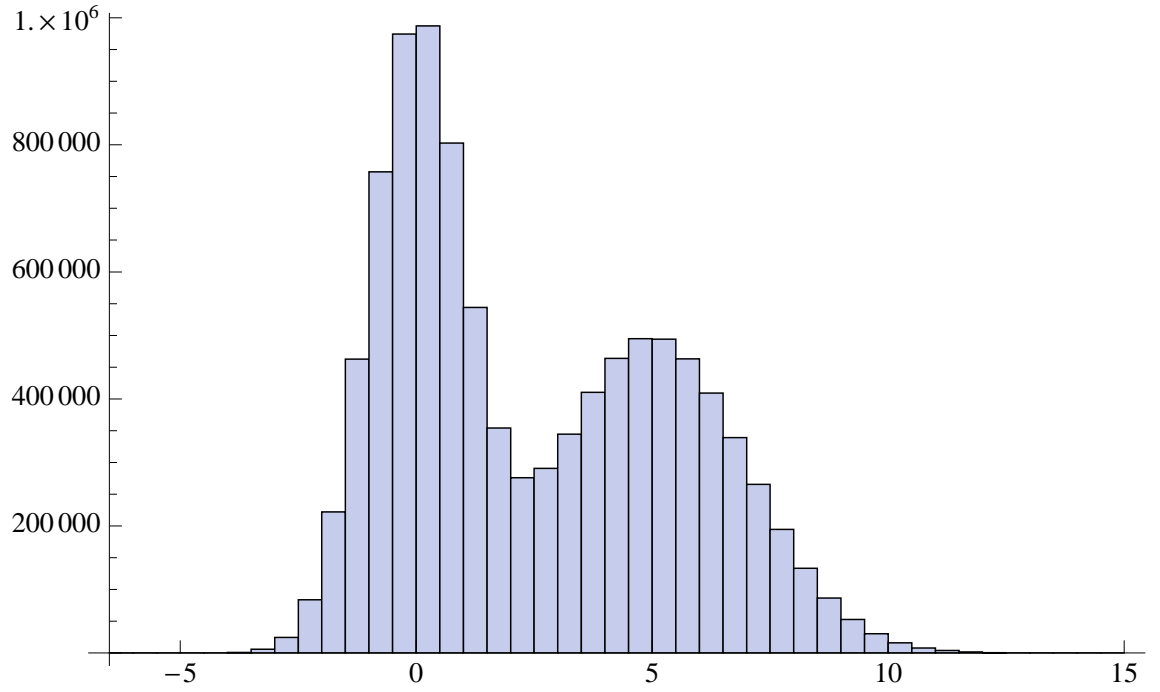
The following histograms are all from the same set of  $10^7$  data points, but with smaller and smaller class widths. Observe how they look more and more like the area under a smooth curve. (By the time we get to 1000 classes, some irregularity in the data becomes visible.)

10 classes.

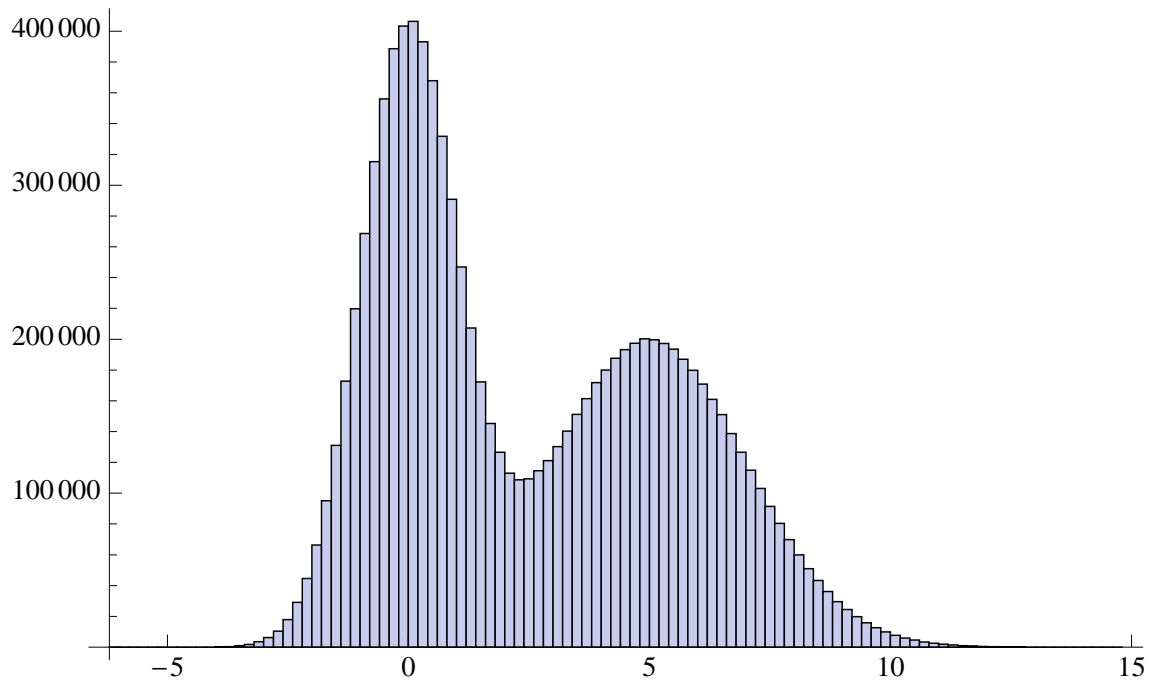


Date: 4 April 2008.

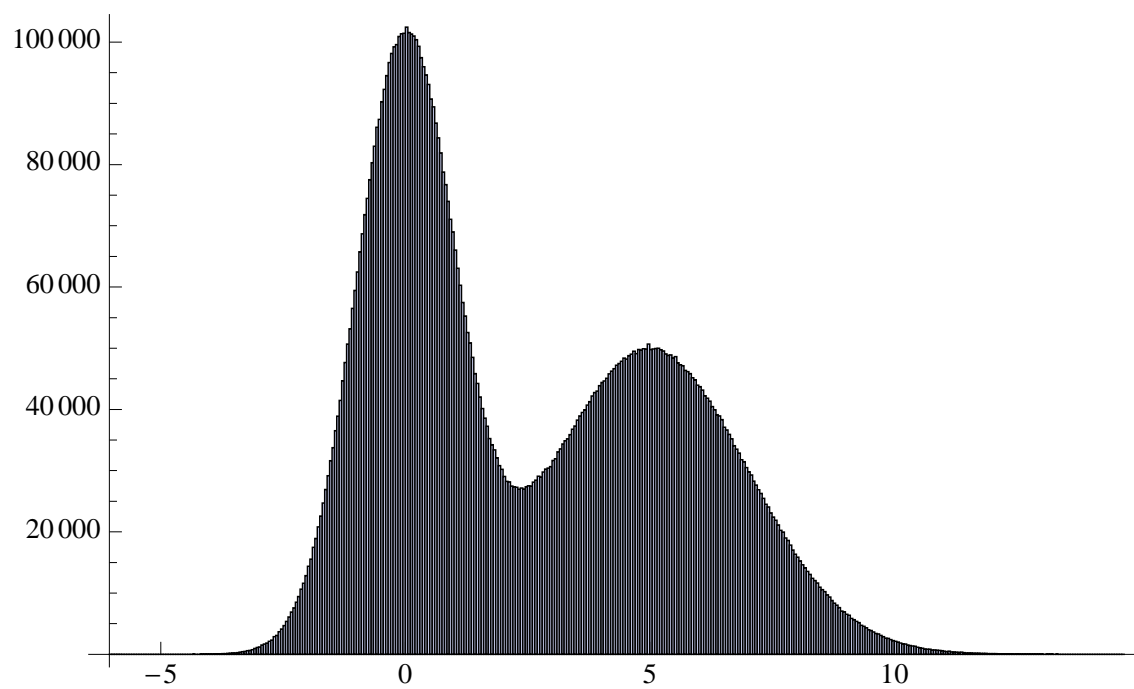
30 classes.



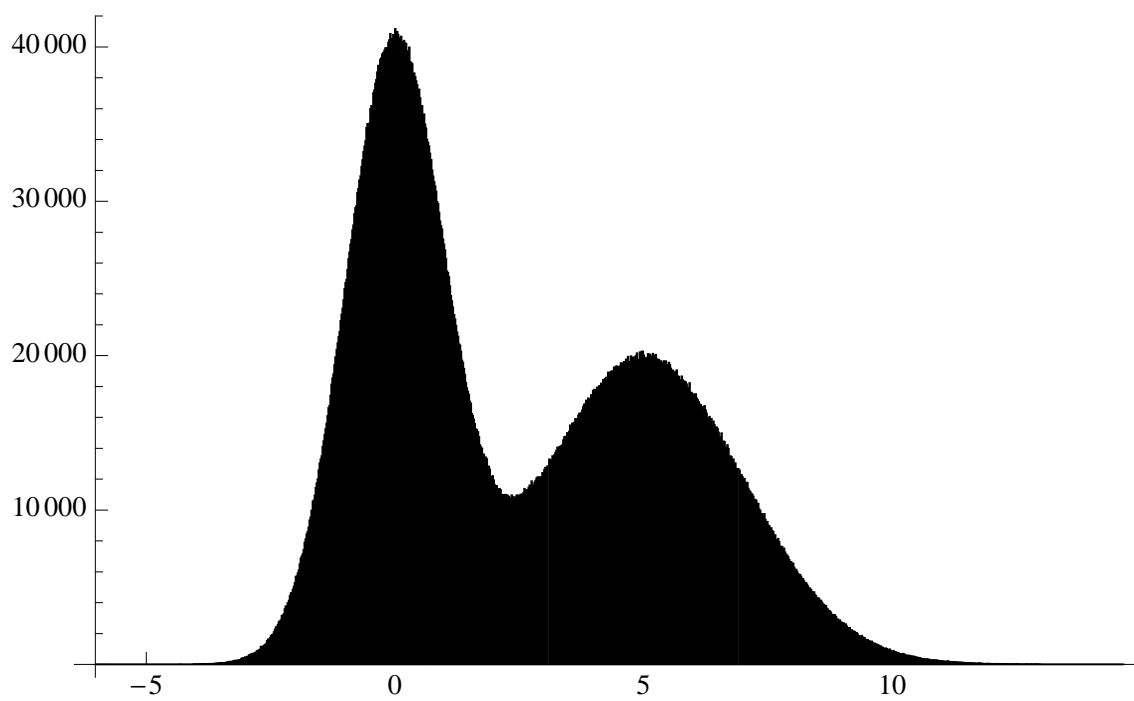
100 classes.



300 classes.



1000 classes.



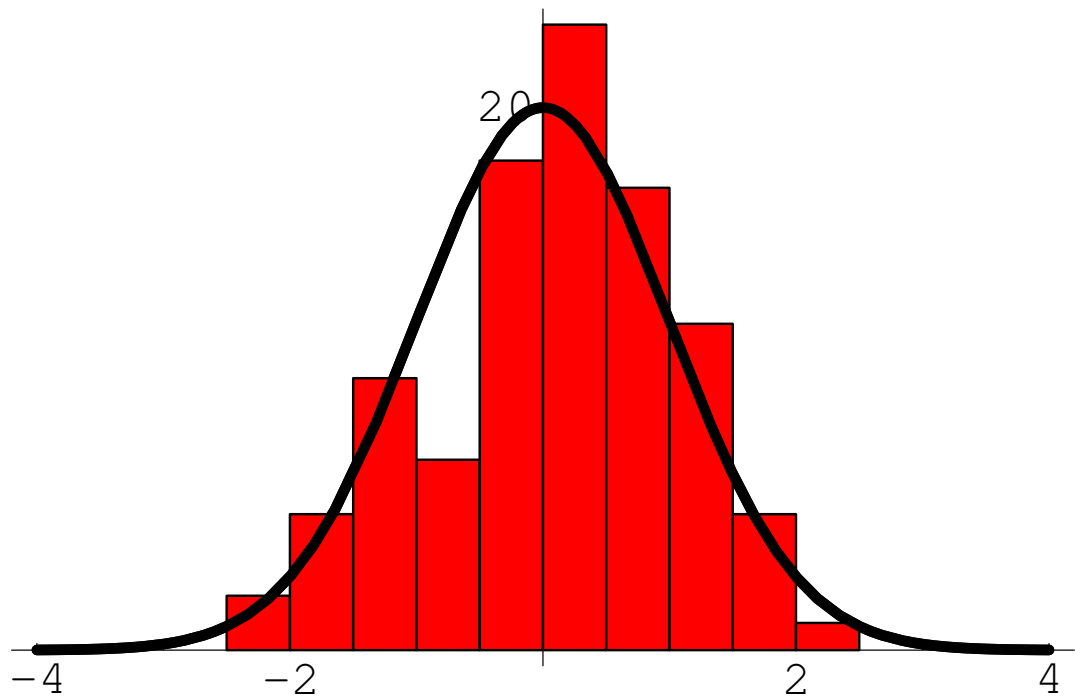
One way to think about density curves:

When you see a density curve, imagine that it is a histogram in which the classes are so narrow that each individual bar in the histogram is too small to see.

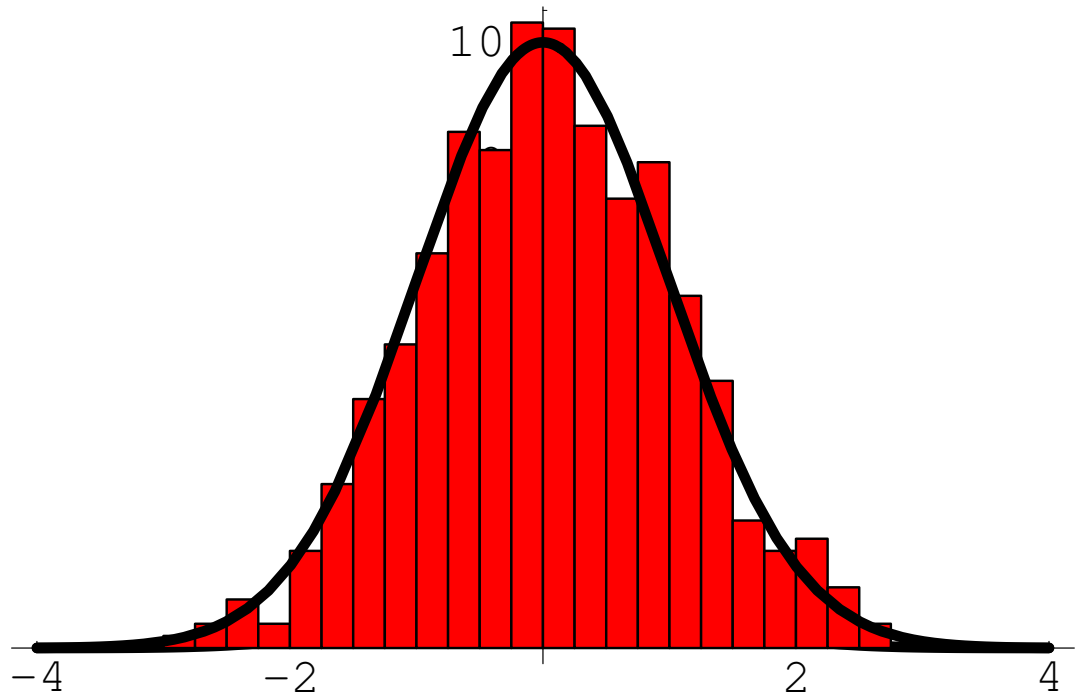
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From histograms to density curves, for the normal distribution.

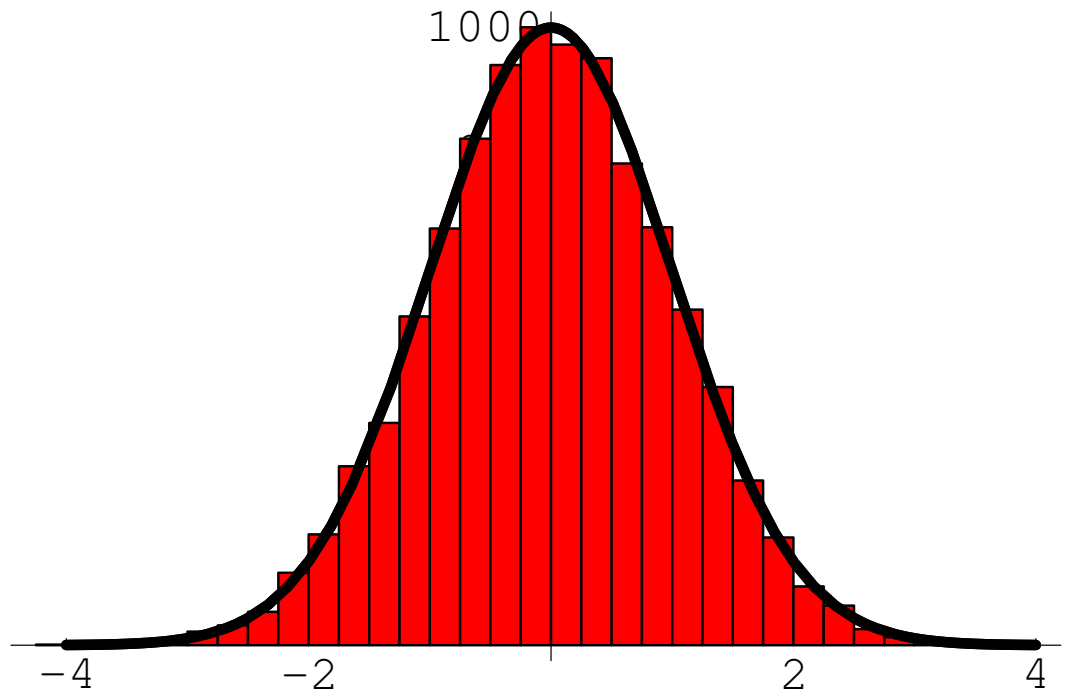
The following histograms show larger and larger numbers of data points chosen randomly from the standard Normal distribution, sometimes with the Normal curve superimposed. Observe that small numbers of normally distributed data points are somewhat irregular, but very large numbers are very regular.



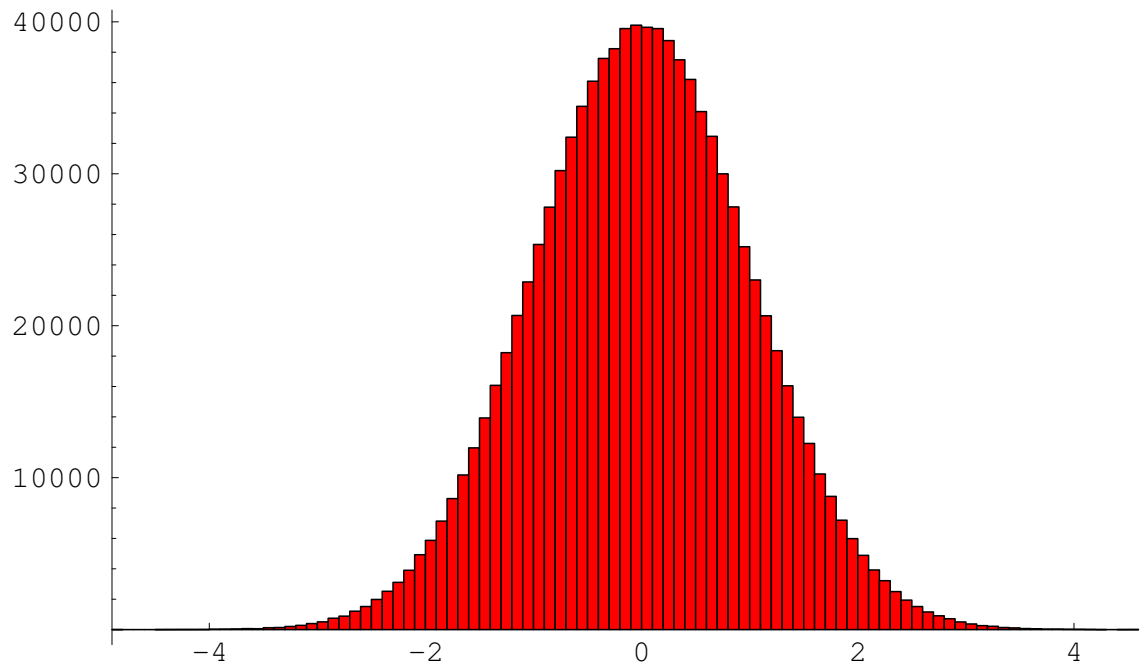
100 observations.



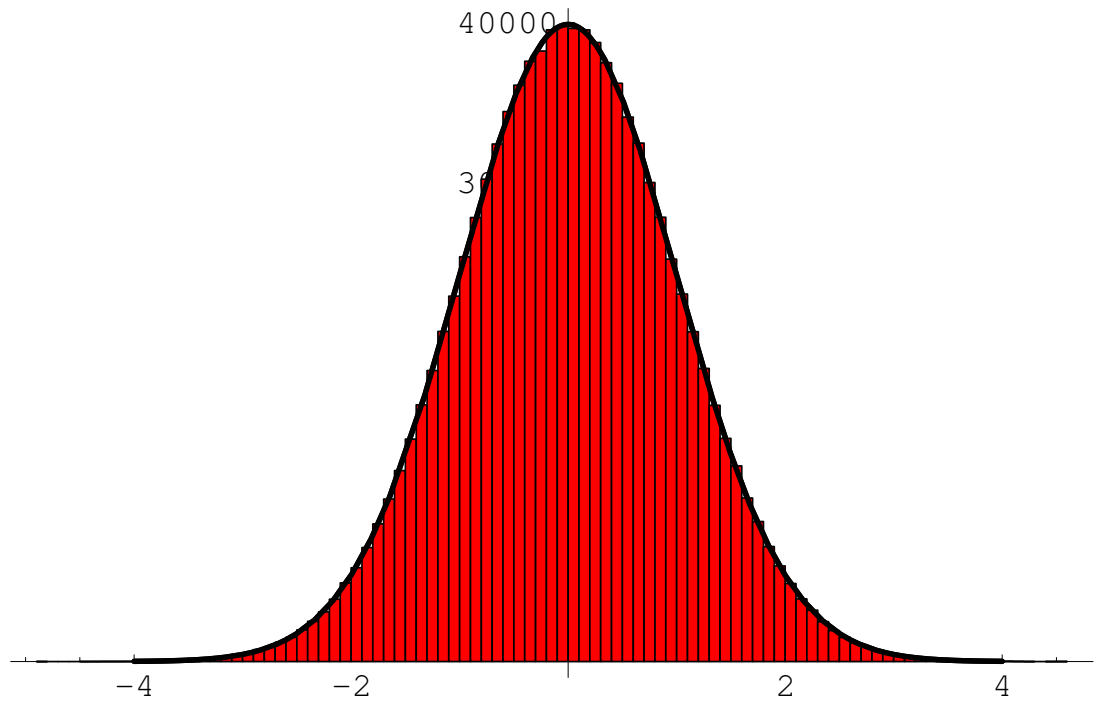
1000 observations.



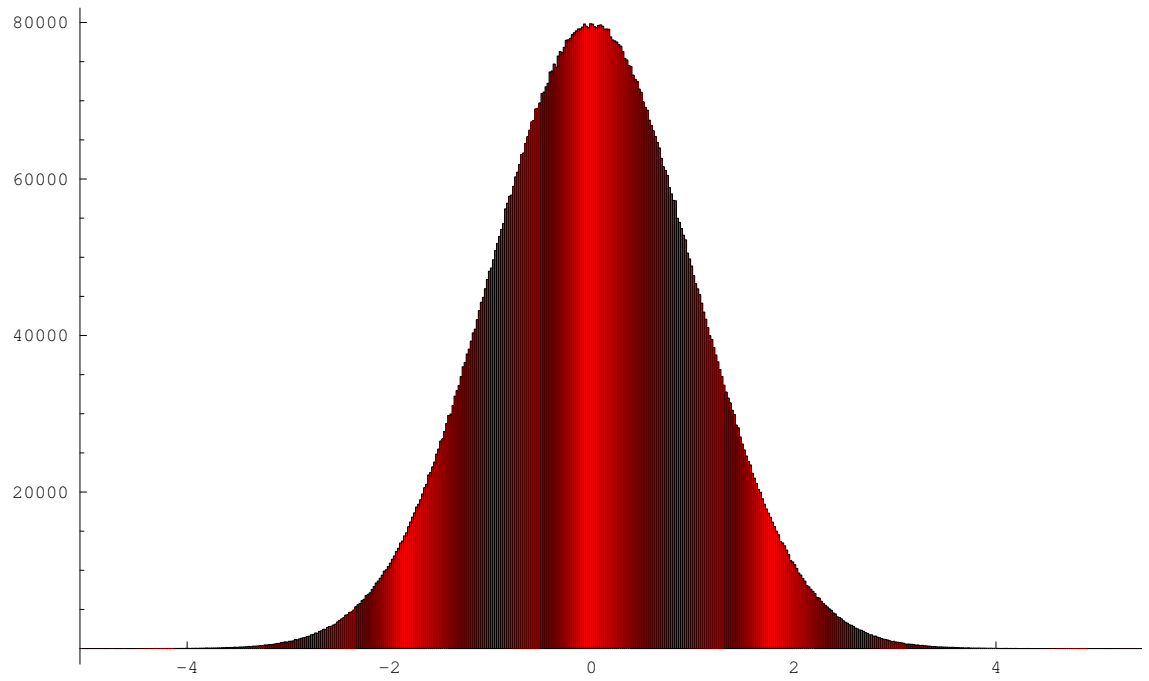
$10^4$  observations.



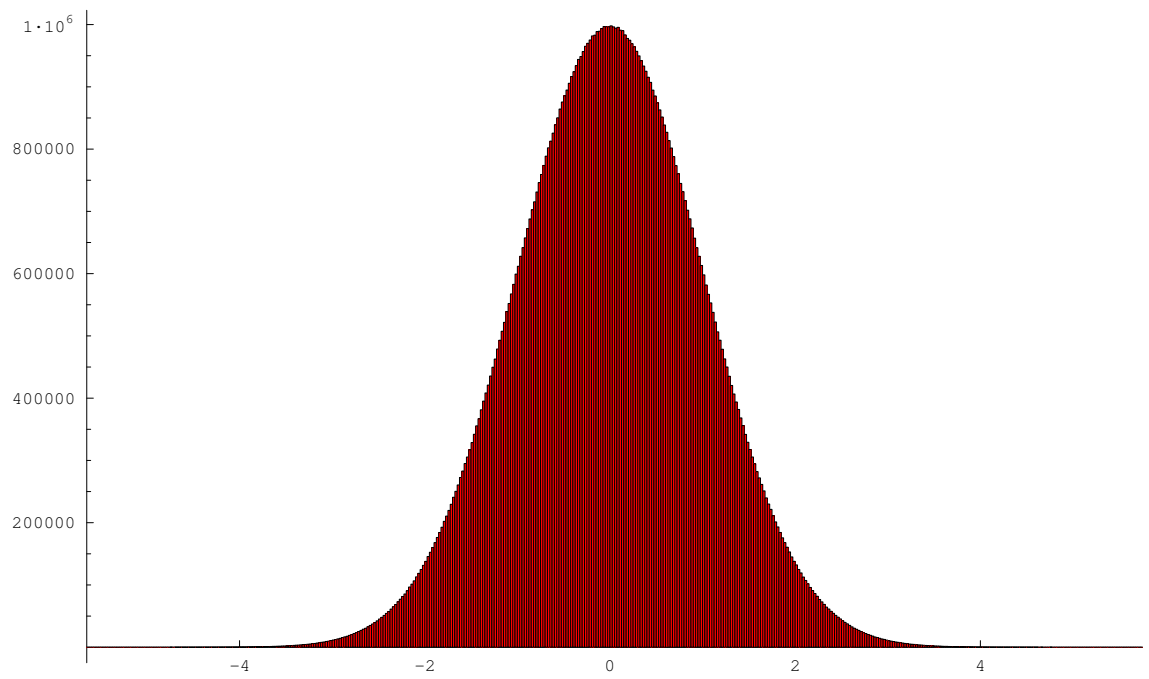
$10^6$  observations, curve not shown.



$10^6$  observations, curve shown.



$10^7$  observations, curve not shown.



$10^8$  observations, curve not shown.