3.12: The Normal Distribution

The ***normal distribution*** is very important. The central limit theorem says that if we average enough values from any distribution, the distribution of the averages we calculate will be the normal distribution. The probability density function for the normal distribution is

$$\frac{df}{du} = \frac{1}{\sigma\sqrt{2\pi}} \exp\left[\frac{-(u-\mu)^2}{2\sigma^2}\right]$$

The integral of the normal distribution from $u = -\infty$ to $u = \infty$ is unity. However, the definite integral between arbitrary limits cannot be obtained as an analytical function. This turns out to be true for some other important distributions also; this is one reason for working with probability density functions rather than the corresponding cumulative probability functions. Of course, the definite integral can be calculated to any desired accuracy by numerical methods, and readily available tables give values for definite integrals from $u = -\infty$ to $u = u$. (We mention normal curve of error tables in Section 3.8, where we introduce a method for testing whether a given set of data conforms to the normal distribution equation.)