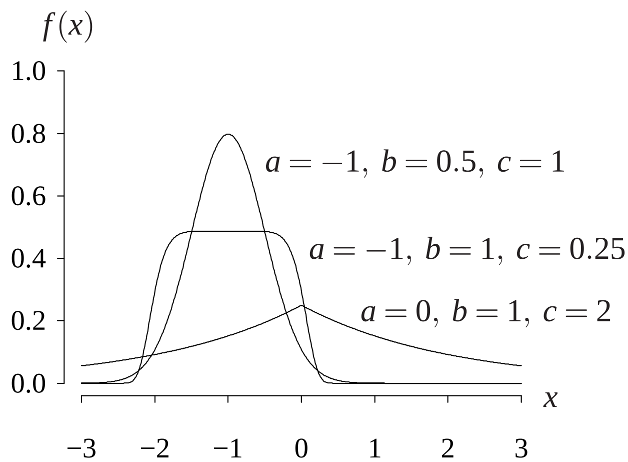
Error distribution (from http://www.math.wm.edu/~leemis/chart/UDR/UDR.html)
The shorthand $X \sim \text{error}(a,b,c)$ is used to indicate that the random variable X has the error distribution with location parameter a, scale parameter b, and shape parameter c. An error random variable X with parameters a, b, and c has probability density function

$$f(x) = \frac{e^{(-|x-a|/b)^{2/c}/2}}{b(2^{c/2+1})\Gamma(c/2+1)} \qquad -\infty < x < \infty$$

for all real values a and for $b > 0$, $c > 0$. The probability density function with three different parameterizations is illustrated below.



The cumulative distribution function on the support of X is

$$F(x) = P(X \le x) = \int_{-\infty}^{x} \frac{e^{(-|t-a|/b)^{2/c}/2}}{b(2^{c/2+1})\Gamma(c/2+1)}dt \qquad -\infty < x < \infty.$$

The survivor function, hazard function, inverse distribution function, moment generating function, and characteristic functions are all mathematically intractable. The population median and mode of X occurs at $x = a$. The population mean, variance, skewness, and kurtosis of X are

$$E[X] = a \qquad V[X] = \frac{2^c b^2 \Gamma(3c/2)}{\Gamma(c/2)}.$$

$$E\left[\left(\frac{X-\mu}{\sigma}\right)^3\right] = 0 \qquad E\left[\left(\frac{X-\mu}{\sigma}\right)^4\right] = \frac{\Gamma(5c/2)\Gamma(c/2)}{(\Gamma(3c/2))^2}.$$

APPL verification: The APPL statements

```
assume(b > 0);
assume(c > 0);
X := [[x -> exp((-abs(x - a) / b) ˆ (2 / c) / 2) / (b * (2 ˆ (c / 2 + 1)) *
       GAMMA(c / 2 + 1))], [-infinity, infinity], ["Continuous", "PDF"]];
CDF(X);
SF(X);
HF(X);
CHF(X);
Mean(X);
Variance(X);
Skewness(X);
Kurtosis(X);
MGF(X);
```

fail due to integration problems.