Finding expected value of a continuous function of a random variable

As you have noted given that X is a continuous random variable with a pdf $f_X(X)$. The expected value of the function g(X) is given by

$$E[g(X)] = \int_{-\infty}^{\infty} g(x) f_X(x)\, dx.$$

As an example, consider the random variable $X \sim U[0,10]$ and the function $h(X) = X^2$. We can find the expected value of h(X) as described above

$$E[h(X)] = \int_{-\infty}^{\infty} h(x) f_X(x)\, dx$$

$$= \int_{0}^{10} x^2 (.1)\, dx$$

$$= \frac{x^3}{3}(.1)\Big|_0^{10}$$

$$= \frac{10^3}{3}(.1) - \frac{0^3}{3}(.1) = 33.\overline{33}$$

Though this example can be readily solved analytically, we can also find this expected value using the integration tools in GAUSS.