

## Not all functions can be integrated

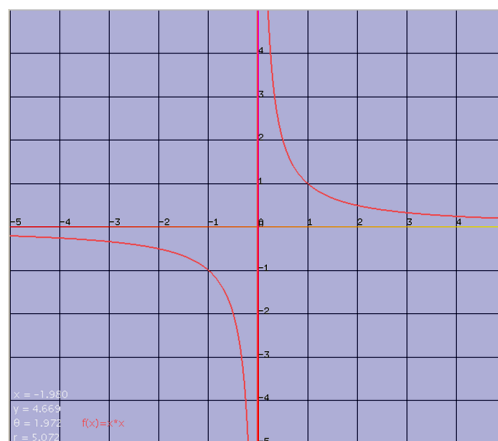
A student might say 'I cannot integrate this function' in three situations:

1. The student cannot find a technique to integrate it, but other people would be able to do so.
2. The integral exists but cannot be expressed (by anyone) in terms of elementary functions. This is true (and can be proved) for several functions. In this case, if a numerical value of an integral is needed, numerical integration on a computer would be used.
3. The function is not integrable, in that the integral simply does not exist. For example,

$\int_0^a \frac{1}{x} dx$  does not exist, since  $1/x$  is undefined at  $x=0$ .

The third context should modify what has been covered before. That is, our discussions of indefinite and definite integrals have assumed that the relevant functions are integrable. We can now see that we have to restrict these ideas to functions which are integrable.

The issue of what classes of functions are integrable is an important aspect of more advanced study.



Graph of  $1/x$