MPL's Absolute_value Operator

The absolute value function satisfies the following four properties:

1. $|a \cdot b| \rightarrow |a| \cdot |b|$.

2. For n an integer, $|a^n| \rightarrow |a|^n$.

3. For $\imath = \sqrt{-1}$, $|\imath| \rightarrow 1$.

4. If an expression has the form $a + \imath b$, where $a \neq 0$ and $b \neq 0$ are free of $\imath$, then $|a + b\,\imath| \rightarrow (a^2 + b^2)^{1/2}$.

Let u be an algebraic expression. The MPL *Absolute_value* operator obtains the absolute value of integers and fractions and applies the above rules when u is not an integer or fraction. If u is not an integer or fraction or one the above forms, the operator returns the unevaluated form "*Absolute_value*"(u). For example,

$$Absolute\_value(-1/2) \rightarrow 1/2,$$
$$Absolute\_value(-2\,x) \rightarrow 2\,Absolute\_value(x),$$
$$Absolute\_value(x + y) \rightarrow Absolute\_value(x + y),$$
$$Absolute\_value(x + 2\,\imath) \rightarrow (x^2 + 4)^{1/2}.$$

Most computer algebra systems have an operator similar to the *Absolute_value* operator:

MPL	Maple	Mathematica	MuPAD
$Absolute\_value(u)$	abs(u)	Abs[u]	abs(u)

(Implementation: Maple (mws), Mathematica (nb), MuPAD (mnb).)

Return to Chapter 1, page 14