

Язык программирования ЛИСП

Примеры пользовательских
функций

Функции вычисления значений

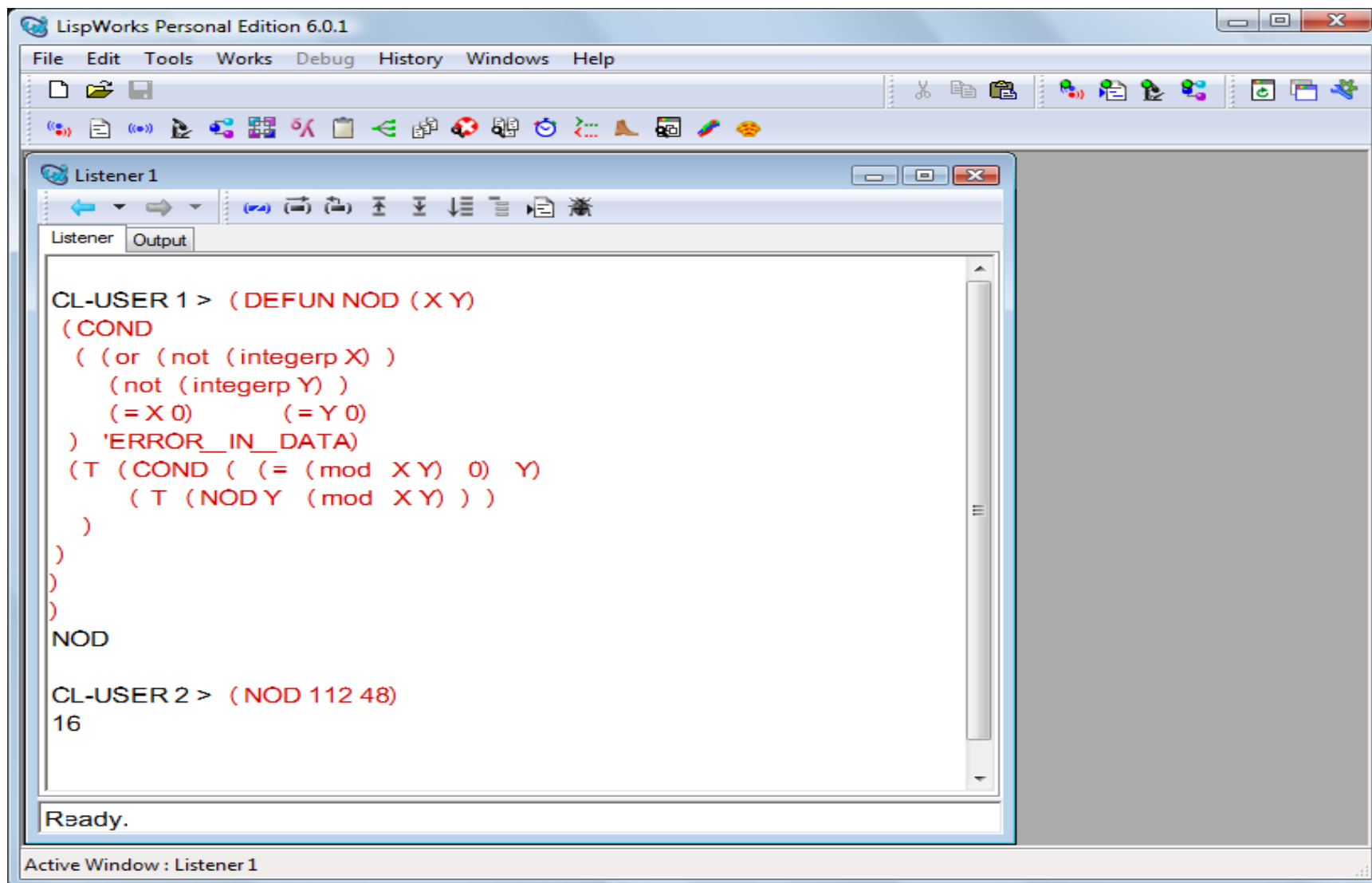
Вычисление наибольшего общего делителя с помощью алгоритма Евклида

$$\text{nod}(a,b) = \begin{cases} b, \text{если } a \bmod b = 0, \\ \text{nod}(b,r), \text{если } a \bmod b = r \neq 0. \end{cases}$$

Вычисление наибольшего общего делителя с помощью алгоритма Евклида

```
(DEFUN NOD(X Y)
(COND
  ((or (not (integerp X))
        (not (integerp Y))
        (= X 0)      (= Y 0))
   ) 'ERROR_IN_DATA)
(T (COND ( (= (mod X Y) 0) Y)
      ( T (NOD Y (mod X Y)))
    )
)
)
)-->NOD
```

Вычисление наибольшего общего делителя с помощью алгоритма Евклида



The screenshot shows the LispWorks Personal Edition 6.0.1 application window. The main menu bar includes File, Edit, Tools, Works, Debug, History, Windows, and Help. Below the menu is a toolbar with various icons for file operations, editing, and debugging. The central area is divided into two panes: 'Listener' and 'Output'. The 'Listener' pane contains the following code:

```
CL-USER 1 > (DEFUN NOD (X Y)
  (COND
    ( (or (not (integerp X))
          (not (integerp Y))
          (= X 0)      (= Y 0)
        ) 'ERROR_IN_DATA)
    (T (COND ( (= (mod X Y) 0) Y)
              ( T (NOD Y (mod X Y) ) )
            )
      )
  )
)
NOD

CL-USER 2 > (NOD 112 48)
16
```

At the bottom of the Listener pane, the text 'Ready.' is displayed. The status bar at the very bottom of the application window indicates 'Active Window : Listener 1'.

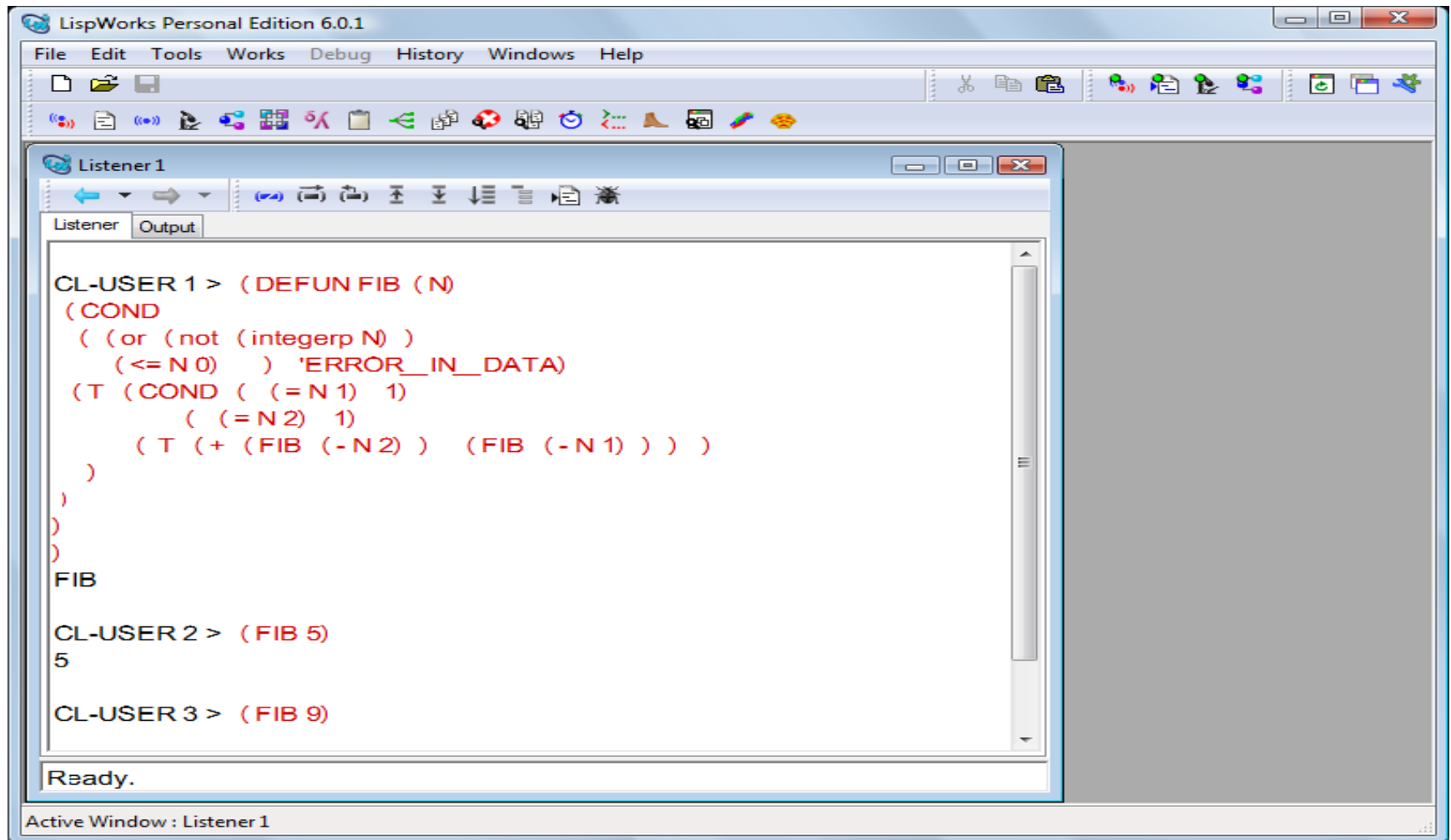
Вычисление n- го члена ряда Фибоначчи

$$fib(n) = \begin{cases} 1 & \text{если } n = 1, \\ 1 & \text{если } n = 2, \\ fib(n-1) + fib(n-2), & \text{если } n > 2 \end{cases}$$

Вычисление n- го члена ряда Фибоначчи

```
(DEFUN FIB(N)
(COND
  ((or (not (integerp N))
        (<= N 0) ) 'ERROR_IN_DATA)
  (T (COND ( (= N 1) 1)
            ( (= N 2) 1)
            ( T (+ (FIB (- N 2)) (FIB (- N 1)))) )
        )
  )
)
)-->FIB
```

Вычисление n- го члена ряда Фибоначчи



The screenshot shows the LispWorks Personal Edition 6.0.1 application window. The main menu bar includes File, Edit, Tools, Works, Debug, History, Windows, and Help. Below the menu is a toolbar with various icons for file operations, editing, and debugging. The central area contains a 'Listener 1' window, which is the active window. It has a toolbar with navigation and execution icons. The Listener window has two tabs: 'Listener' and 'Output'. The 'Listener' tab is active, showing the following code:

```
CL-USER 1 > (DEFUN FIB (N)
  (COND
    ( (or (not (integerp N))
          (<= N 0) ) 'ERROR_IN_DATA)
    (T (COND ( (= N 1) 1)
              ( (= N 2) 1)
              (T (+ (FIB (- N 2)) (FIB (- N 1)) ) ) )
    )
  )
)
FIB

CL-USER 2 > (FIB 5)
5

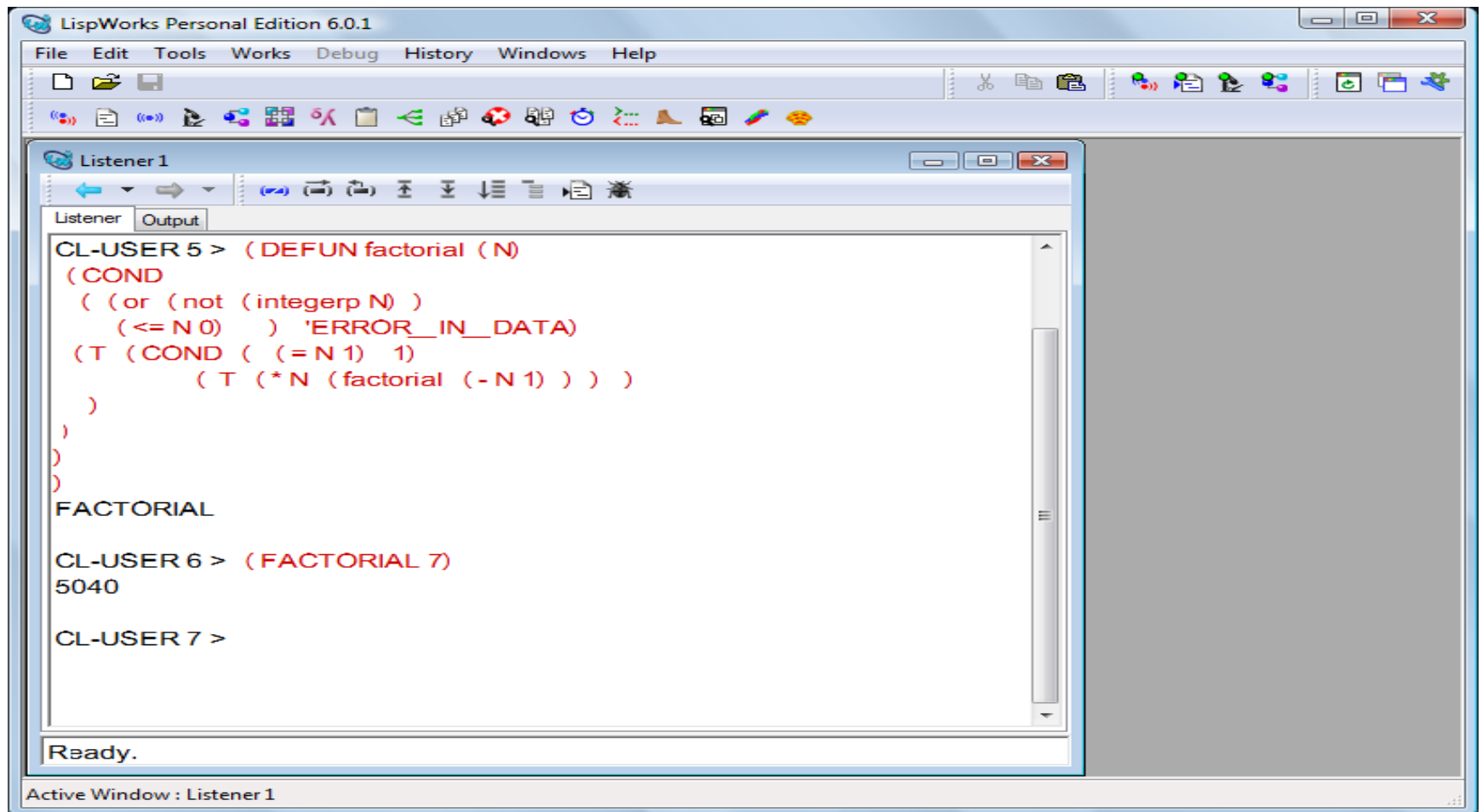
CL-USER 3 > (FIB 9)
```

The 'Output' tab is empty. At the bottom of the Listener window, the text 'Ready.' is displayed. The status bar at the bottom of the application window indicates 'Active Window : Listener 1'.

Вычисление n!

```
(DEFUN factorial(N)
(COND
  ((or (not (integerp N))
        (<= N 0) ) 'ERROR_IN_DATA)
  (T (COND ( (= N 1) 1)
            ( T (* N (factorial (- N 1))) )
          )
    )
)
)
)
```

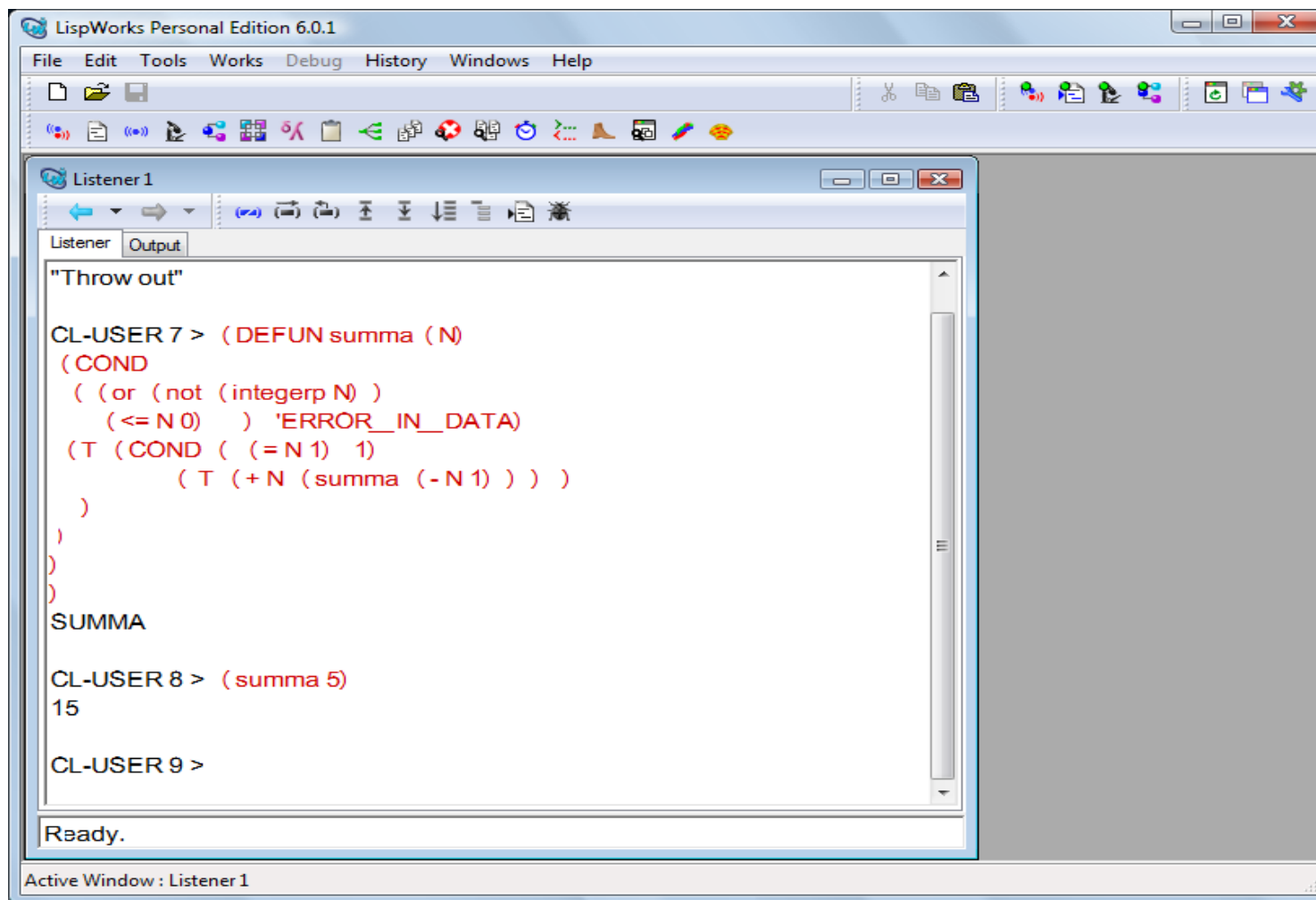
Вычисление $n!$



Вычисление суммы n членов ряда натуральных чисел

```
(DEFUN summa(N)
(COND
  ((or (not (integerp N))
        (<= N 0) ) 'ERROR_IN_DATA)
  (T (COND ( (= N 1) 1)
            ( T (+ N (summa (- N 1)))) )
    )
)
)
)
```

Вычисление суммы n членов ряда натуральных чисел



The screenshot shows the LispWorks Personal Edition 6.0.1 application window. The main window has a menu bar (File, Edit, Tools, Works, Debug, History, Windows, Help) and a toolbar. A 'Listener 1' window is open, displaying the following text:

```
"Throw out"

CL-USER 7 > (DEFUN summa (N)
  (COND
    ( (or (not (integerp N))
          (<= N 0) ) 'ERROR_IN_DATA)
    (T (COND ( (= N 1) 1)
              ( T (+ N (summa (- N 1)) ) ) )
    )
  )
)
SUMMA

CL-USER 8 > (summa 5)
15

CL-USER 9 >
```

At the bottom of the Listener window, it says "Ready." The status bar at the very bottom of the application window indicates "Active Window : Listener 1".

Вычисление суммы

```
(DEFUN summa28(A N)
(COND
  ((or (not (integerp N))
        (not (numberp A))
        (<= N 0) ) 'ERROR_IN_DATA)
  (T (COND ( (= N 1) A)
            ( T (+ (summa28 A (- N 1))
                    (/ A (factorial N))
                  ) )
      )
  )
)
)
)
)
```

$$S = \sum_{i=1}^n \frac{a}{i!}, a \neq 0$$

Вычисление суммы

$$S = \sum_{i=1}^n \frac{a}{i!}, a \neq 0$$

The screenshot shows the LispWorks Personal Edition 6.0.1 application window. The main window is titled "Listener 1" and contains a text area with the following Lisp code and output:

```
CL-USER 2 > (DEFUN summa28 (A N)
  (COND
    ((or (not (integerp N))
         (not (numberp A))
         (<= N 0)) 'ERROR__IN__DATA)
    (T (COND ((= N 1) A)
              (T (+ (summa28 A (- N 1))
                    (/ A (factorial N))
                   ) )
      )
    )
  )
)
SUMMA28

CL-USER 3 > (summa28 2.0 4)
3.4166665

Ready.
```

The status bar at the bottom indicates "Active Window : Listener 1".