

Programação Funcional

Unidade 4 – Visão geral da Linguagem Clojure

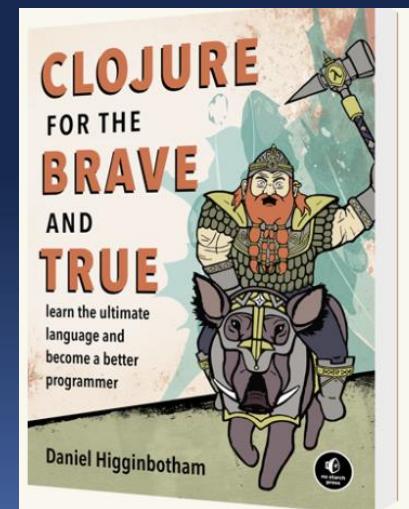
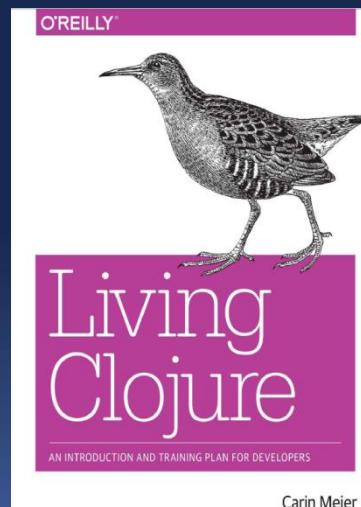
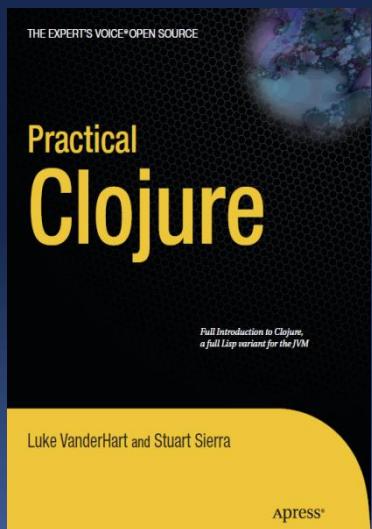
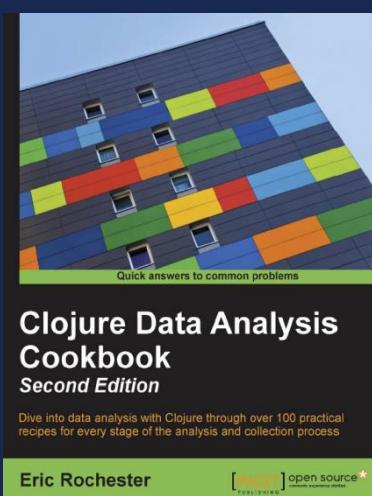
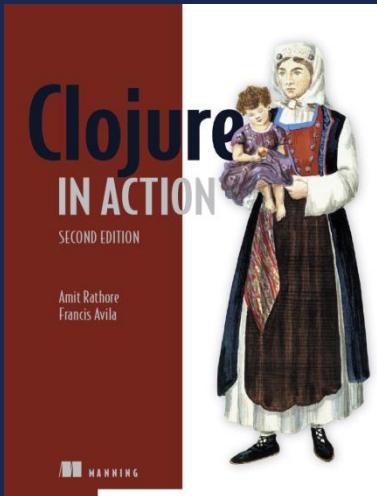
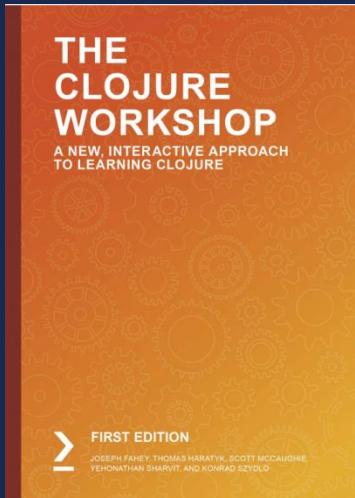


Prof. Aparecido V. de Freitas
Doutor em Engenharia
da Computação pela EPUSP
aparecido.freitas@prof.uscs.edu.br
aparecidovfreitas@gmail.com



Revisão Técnica: Maurício Szabo
mauricio.szabo@gmail.com

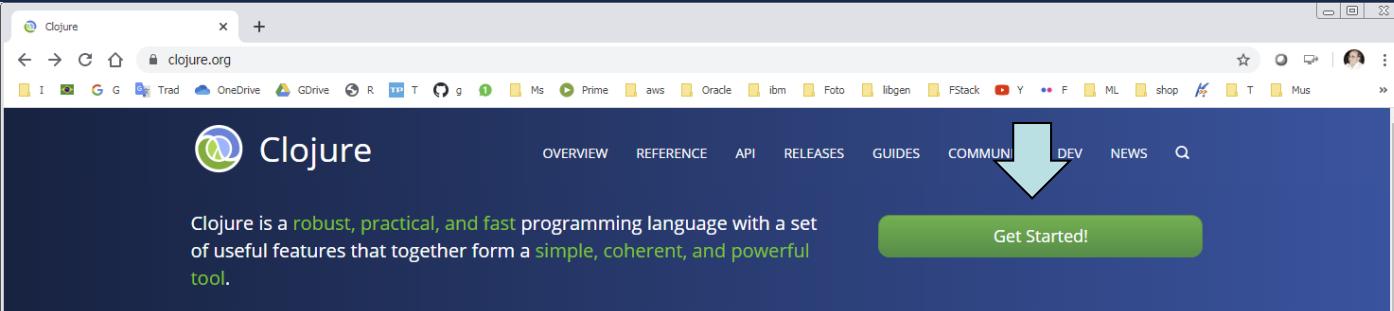
Bibliografia



Antes de iniciar

- ✓ Antes de iniciar a instalação do **Clojure**, esteja certo de que **JDK** está instalado;
- ✓ **Clojure** é implementado em **Java** e roda na **JVM** (Java Virtual Machine);
- ✓ **Clojure** é desenhado para ser uma **hosted language**, enquanto que uma outra implementação, chamada **ClojureScript**, roda em qualquer runtime **JavaScript**, por exemplo, um web browser ou Node.js;
- ✓ **Clojure** **não** requer uma versão particular da Máquina Virtual Java;
- ✓ Mas, recomenda-se que a versão **Java 8** seja instalada;
- ✓ Instruções de instalação em <https://clojure.org/>
- ✓ É possível interagir códigos **Clojure** com libraries (packages) escritos em Java (**API'S escritas em Java**);

<https://clojure.org/>



The Clojure Programming Language

Clojure is a dynamic, general-purpose programming language, combining the approachability and interactive development of a scripting language with an efficient and robust infrastructure for multithreaded programming. Clojure is a compiled language, yet remains completely dynamic – every feature supported by Clojure is supported at runtime. Clojure provides easy access to the Java frameworks, with optional type hints and type inference, to ensure that calls to Java can avoid reflection.

Clojure is a dialect of Lisp, and shares with Lisp the code-as-data philosophy and a powerful macro system. Clojure is predominantly a functional programming language, and features a rich set of immutable, persistent data structures. When mutable state is needed, Clojure offers a software transactional memory system and reactive Agent system that ensure clean, correct, multithreaded designs.

I hope you find Clojure's combination of facilities elegant, powerful, practical and fun to use.

Rich Hickey
author of Clojure and CTO Cognitect

Companies Succeeding with Clojure

"Our Clojure system just handled its first Walmart black Friday and came out without

"Clojure is a functional programming language from top to bottom. This means

"We discussed the existing Clojure community: the maturity of the language

Learn More

Rationale

A brief overview of Clojure and the features it includes

Getting Started

Resources for getting Clojure up and running

Reference

Grand tour of all that Clojure has to offer

Guides

Walkthroughs to help you learn along the way

Community

We have a vibrant, flourishing community. Join us!



Instruções de Instalação

Local build

Download and build Clojure from source (requires Git, Java, and Maven):

```
git clone https://github.com/clojure/clojure.git  
cd clojure  
mvn -Plocal -Dmaven.test.skip=true package
```

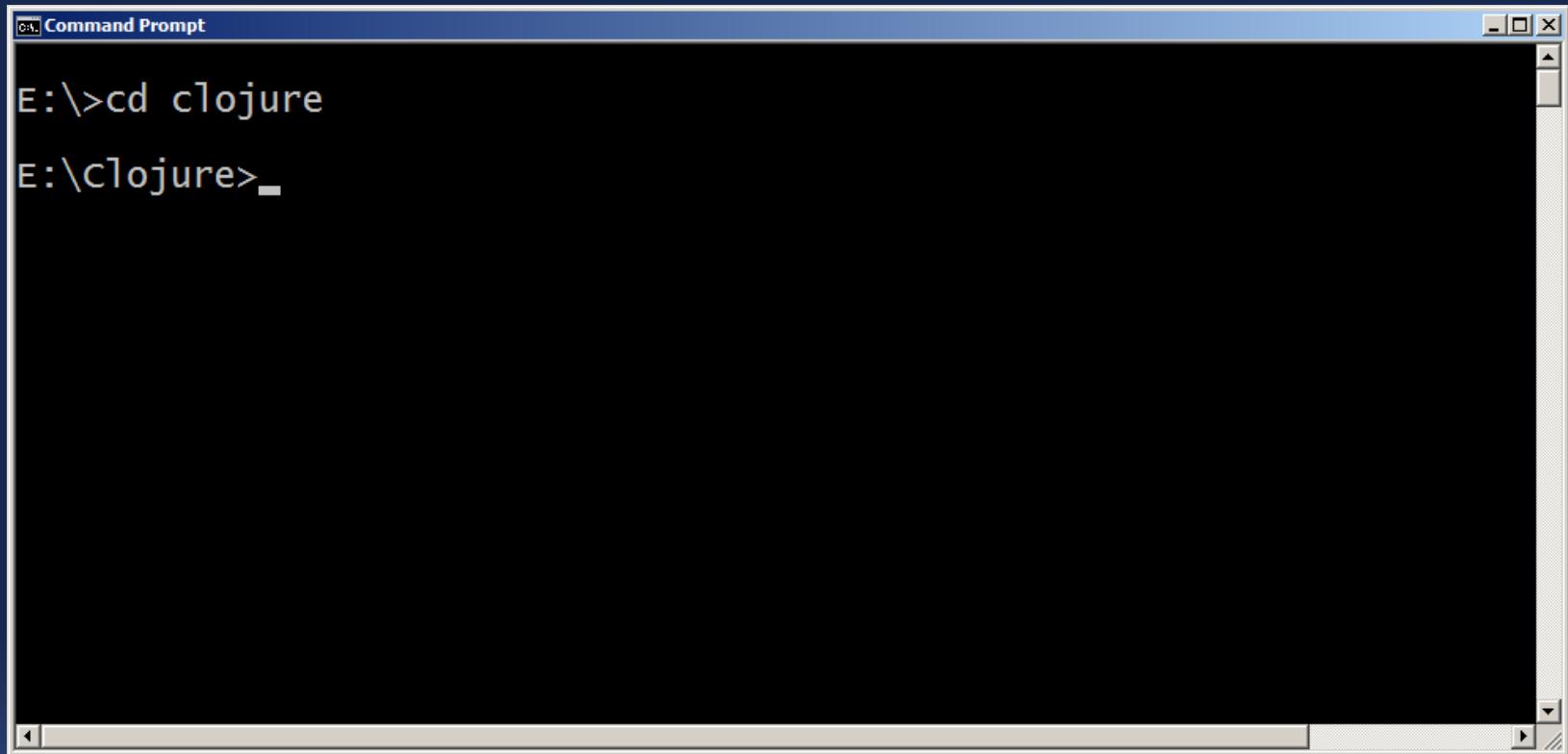
Then start the REPL with the local jar:

```
java -jar clojure.jar
```

Try Clojure online

[repl.it](#) provides a browser-based Clojure repl for interactive exploration.

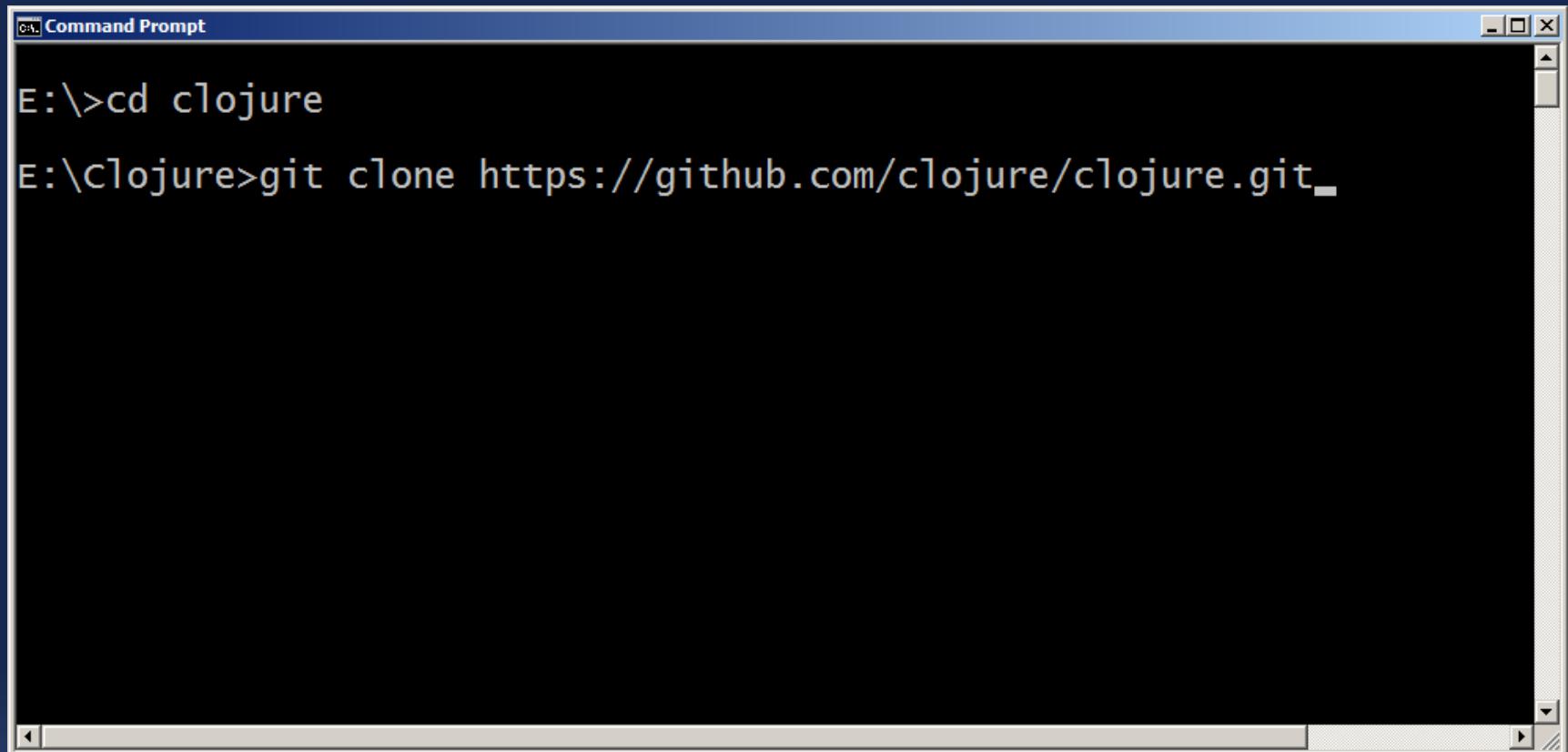
Criar pasta E:\closure



A screenshot of a Windows Command Prompt window titled "Command Prompt". The window has a blue header bar with the title and standard window controls (minimize, maximize, close). The main area is black with white text. The user has typed the command "E:\>cd closure" and is now at the prompt "E:\closure>". The window is set against a dark blue background.

```
E:\>cd closure
E:\closure>
```

Baixando clojure



The screenshot shows a Windows Command Prompt window titled "Command Prompt". The window contains the following text:

```
E:\>cd clojure  
E:\Clojure>git clone https://github.com/clojure/clojure.git
```

Baixando clojure

```
C:\ Command Prompt  
E:\>cd clojure  
  
E:\clojure>git clone https://github.com/clojure/clojure.git  
Cloning into 'clojure'...  
remote: Enumerating objects: 41, done.  
remote: Counting objects: 100% (41/41), done.  
remote: Compressing objects: 100% (28/28), done.  
remote: Total 32714 (delta 11), reused 29 (delta 9), pack-reused 3267  
Receiving objects: 100% (32714/32714), 14.92 MiB | 7.40 MiB/s, done.  
Resolving deltas: 100% (19735/19735), done.  
  
E:\clojure>_
```

Pasta Clojure

Name	Date modified	Type	Size
.git	20-May-20 2:00 PM	File folder	
.idea	20-May-20 2:00 PM	File folder	
doc	20-May-20 2:00 PM	File folder	
src	20-May-20 2:00 PM	File folder	
test	20-May-20 2:00 PM	File folder	
	20-May-20 2:00 PM	Text Document	1 KB
antsetup	20-May-20 2:00 PM	Shell Script	1 KB
build	20-May-20 2:00 PM	XML Document	9 KB
changes	20-May-20 2:00 PM	Markdown Source File	115 KB
clojure.iml	20-May-20 2:00 PM	IML File	2 KB
CONTRIBUTING	20-May-20 2:00 PM	Markdown Source File	1 KB
epl-v10	20-May-20 2:00 PM	Chrome HTML Docu...	13 KB
pom	20-May-20 2:00 PM	XML Document	11 KB
readme	20-May-20 2:00 PM	Text Document	14 KB

Building Clojure com Maven

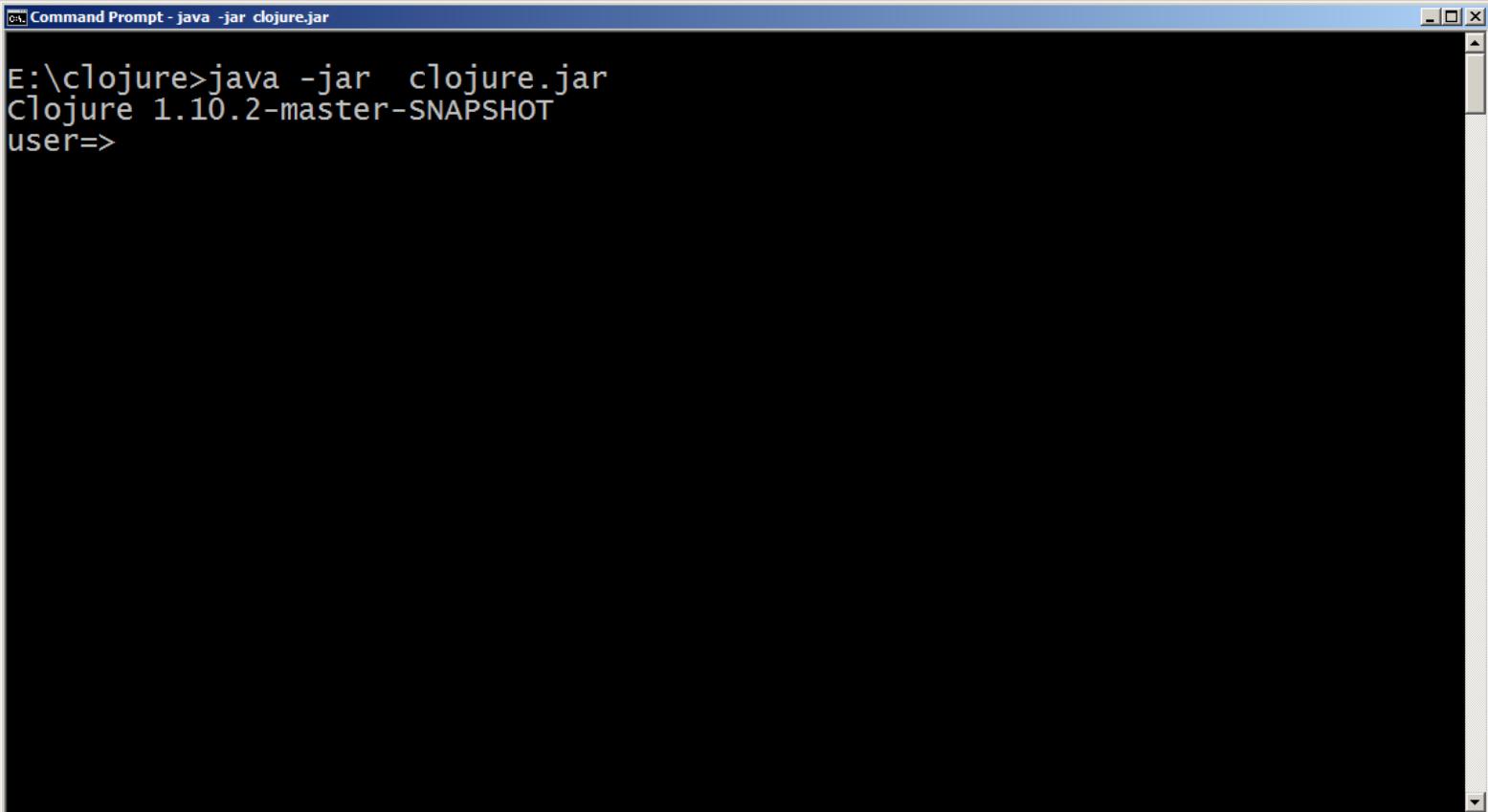
Mvn –Plocal –Dmaven.test.skip=true package

```
Command Prompt
Downloaded from central: https://repo.maven.apache.org/maven2/org/vafer/jdependency/1.2/jdependency-1.2.jar (22 kB at 20 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/com/google/guava/guava/19.0/guava-19.0.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/ow2/asm/asm-analysis/6.0_BETA/asm-analysis-6.0_BETA.jar (21 kB at 16 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/jdom/jdom/1.1.3/jdom-1.1.3.jar (151 kB at 117 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/eclipse/aether/aether-util/0.9.0.M2/aether-util-0.9.0.M2.jar (134 kB at 100 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/ow2/asm/asm-util/6.0_BETA/asm-util-6.0_BETA.jar (47 kB at 35 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/com/google/guava/guava/19.0/guava-19.0.jar (2.3 MB at 391 kB/s)
[INFO] Including org.clojure:spec.alpha:jar:0.2.187 in the shaded jar.
[INFO] Including org.clojure:core.specs.alpha:jar:0.2.44 in the shaded jar.
[INFO] Including org.clojure:test.check:jar:0.9.0 in the shaded jar.
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 02:28 min
[INFO] Finished at: 2020-05-20T14:12:28-03:00
[INFO] -----
```

E:\clojure>

Iniciando REPL

java -jar clojure.jar



The screenshot shows a Windows Command Prompt window titled "Command Prompt - java -jar clojure.jar". The command entered is "E:\clojure>java -jar clojure.jar". The output shows "Clojure 1.10.2-master-SNAPSHOT" followed by the Clojure user prompt "user=>". The window has a standard Windows title bar and scroll bars.

```
E:\clojure>java -jar clojure.jar
Clojure 1.10.2-master-SNAPSHOT
user=>
```

Testando REPL

java -jar clojure.jar



```
Command Prompt - java -jar clojure.jar
E:\clojure>java -jar clojure.jar
Clojure 1.10.2-master-SNAPSHOT
user=> (+ 2 3 )
5
user=>
```

Clojure installer e CLI tools

Clojure installer e CLI tools

Clojure installer and CLI tools

Clojure provides [command line tools](#) that can be used to start a Clojure repl, use Clojure and Java libraries, and start Clojure programs. See the [changelog](#) for version information.

After following these installation instructions, you should be able to use the `clj` or `clojure` command to start a Clojure repl.

Installation on Windows

An early release version of clj on Windows is available at [clj on Windows](#). Please provide feedback at <https://clojure.atlassian.net/projects/TDEPS>.

clj on Windows

clj on Windows

Alex Miller edited this page 5 days ago · 37 revisions

Currently, `clj` on Windows is in an alpha state. Please try it and provide feedback in the [TDEPS jira](#) or on [#clj-on-windows](#) room on [Clojurians slack](#).

Install

Make sure [PowerShell 5](#) (or later, include PowerShell Core) and [.NET Core SDK 2.1+](#) or [.NET Framework 4.5+](#) (or later) are installed. Then run:

```
Invoke-Expression (New-Object System.Net.WebClient).DownloadString('https://download.clojure.org/install/win-install-1.10.1.561.ps1')
```

clj on Windows

Alternatively, download the latest version of the installer and run the downloaded copy:

- 
- <https://download.clojure.org/install/win-install-1.10.1.561.ps1>

When you run the installer, you will be prompted with several possible install locations:

```
PS Y:\Downloads> .\win-install-1.10.1.561.ps1
Downloading Clojure tools
WARNING: Clojure will install as a module in your PowerShell module path.

Possible install locations:
1) \\Drive\Home\Documents\WindowsPowerShell\Modules
2) C:\Program Files\WindowsPowerShell\Modules
3) C:\WINDOWS\system32\WindowsPowerShell\v1.0\Modules\
Enter number of preferred install location: 1

Cleaning up existing install
Installing PowerShell module
Removing download
Clojure now installed. Use "clj -h" for help.
```

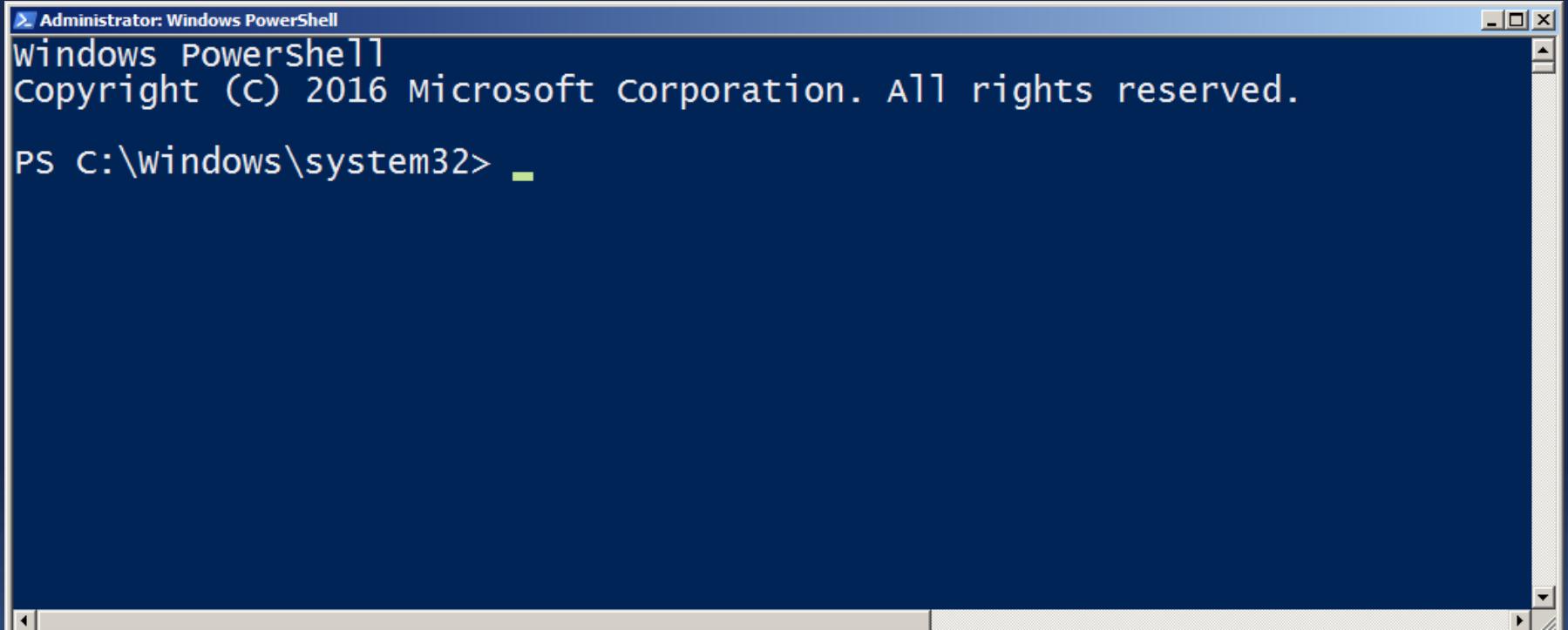
When choosing which location to install consider these tradeoffs:

- #1 can be installed without admin privileges but will create a directory in Documents
- #2 and 3 should probably be run only if you have admin privileges



clj on Windows

- ✓ A instalação será feita com Powershell versão 5
- ✓ Esteja certo de que **PowerShell 5** ou superior esteja instalado em sua máquina;



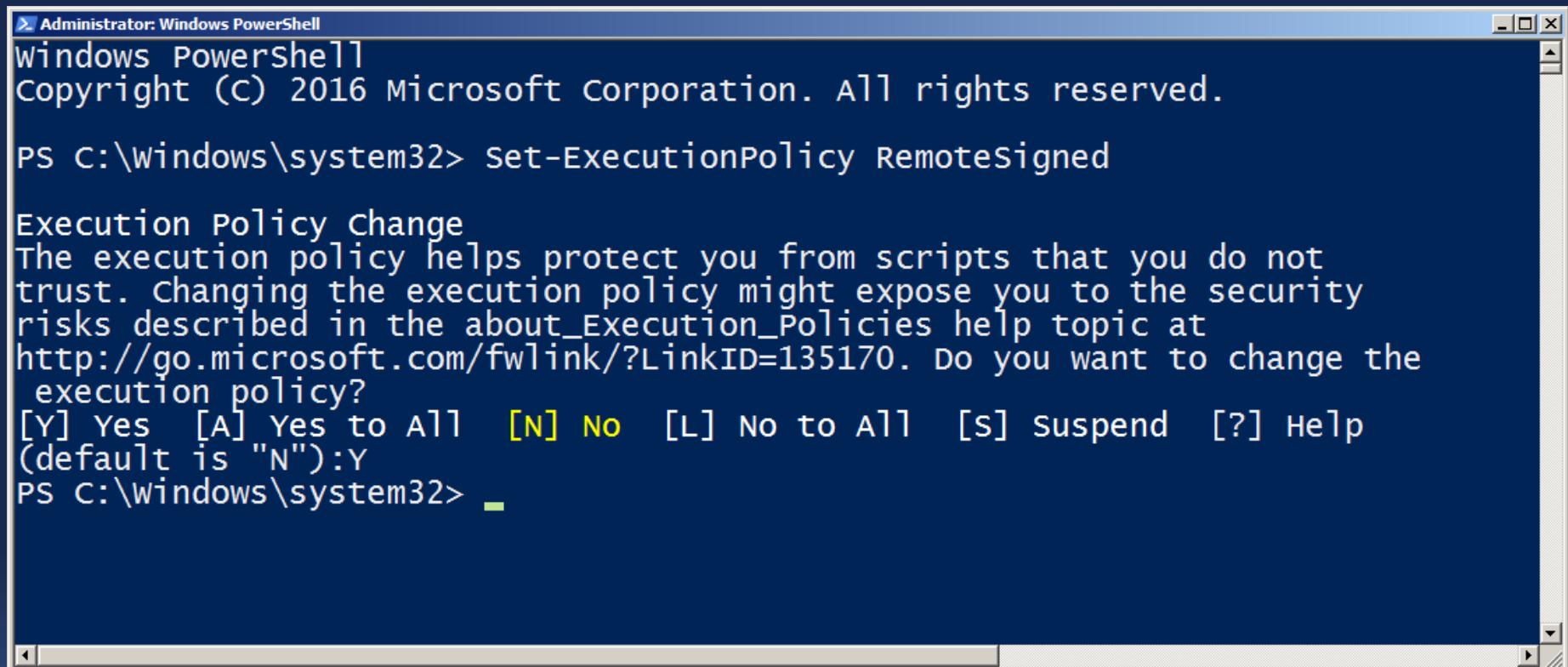
A screenshot of a Windows PowerShell window titled "Administrator: Windows PowerShell". The title bar also includes the text "Windows PowerShell" and "Copyright (c) 2016 Microsoft Corporation. All rights reserved.". The command prompt shows "PS C:\windows\system32>". The window has a standard Windows border and title bar.

Configurações de segurança - Powershell



Habilitar PowerShell para execução

- ✓ No prompt do PowerShell: **Set-ExecutionPolicy RemoteSigned**



```
Administrator: Windows PowerShell
windows Powershell
Copyright (c) 2016 Microsoft Corporation. All rights reserved.

PS C:\Windows\system32> Set-ExecutionPolicy RemoteSigned

Execution Policy Change
The execution policy helps protect you from scripts that you do not
trust. Changing the execution policy might expose you to the security
risks described in the about_Execution_Policies help topic at
http://go.microsoft.com/fwlink/?LinkID=135170. Do you want to change the
execution policy?
[Y] Yes [A] Yes to All [N] No [L] No to All [S] Suspend [?] Help
(default is "N"):Y
PS C:\Windows\system32>
```

Habilitar PowerShell para execução

- ✓ No prompt do PowerShell: (em modo administrador)

`Set-ExecutionPolicy -Scope Process -ExecutionPolicy Bypass`

Fix for PowerShell Script Not Digitally Signed

When you run a .ps1 PowerShell script you might get the message saying
“.ps1 is not digitally signed. The script will not execute on the system.”

To fix it you have to run the command below to run Set-ExecutionPolicy and change the Execution Policy setting.

```
Set-ExecutionPolicy -Scope Process -ExecutionPolicy Bypass
```

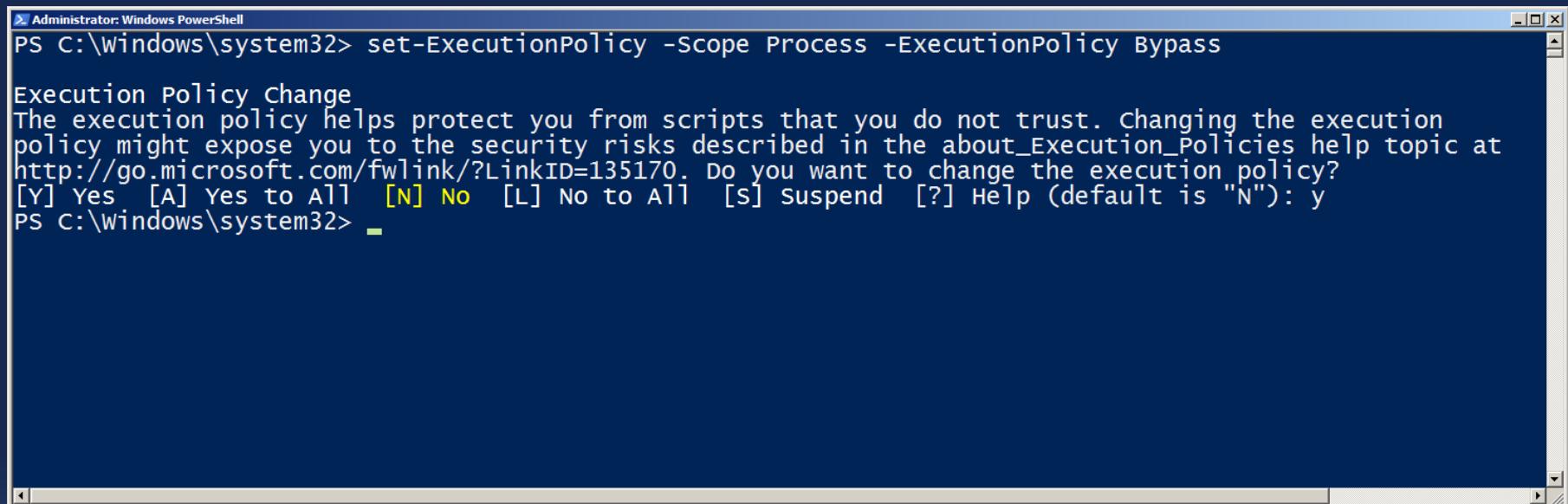
This command sets the execution policy to bypass for only the current PowerShell session after the window is closed, the next PowerShell session will open running with the default execution policy. “Bypass” means nothing is blocked and no warnings, prompts, or messages will be displayed.



Habilitar PowerShell para execução

- ✓ No prompt do PowerShell: (em modo administrador)

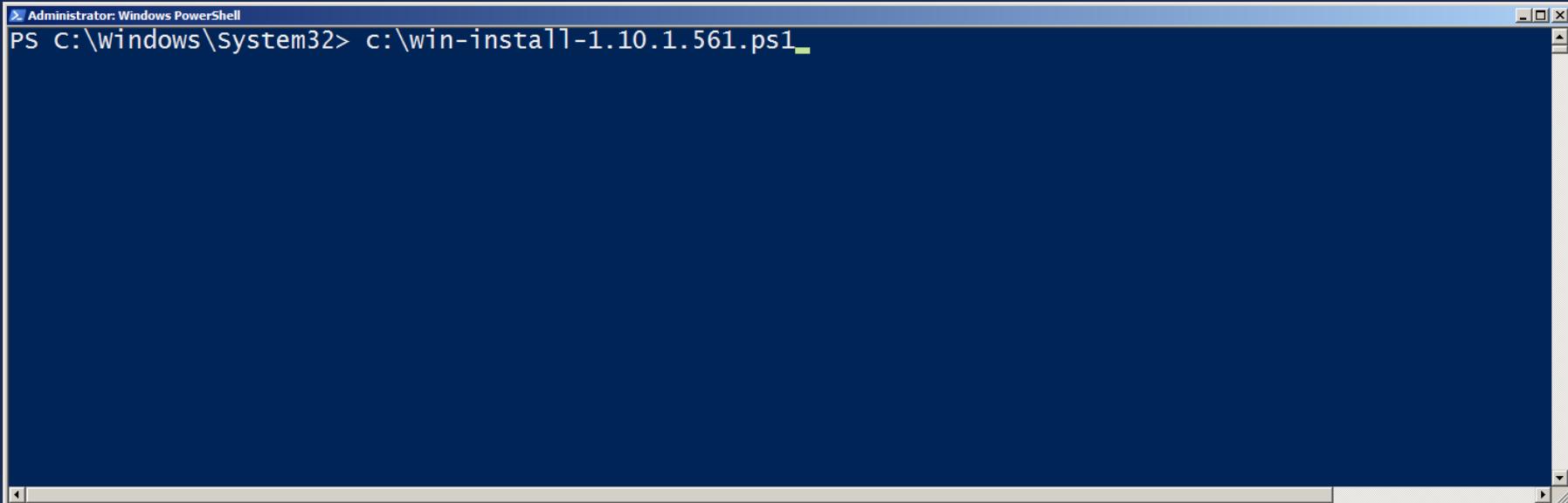
Set-ExecutionPolicy -Scope Process -ExecutionPolicy Bypass



```
Administrator: Windows PowerShell
PS C:\Windows\system32> set-ExecutionPolicy -Scope Process -ExecutionPolicy Bypass
Execution Policy Change
The execution policy helps protect you from scripts that you do not trust. Changing the execution
policy might expose you to the security risks described in the about_Execution_Policies help topic at
http://go.microsoft.com/fwlink/?LinkId=135170. Do you want to change the execution policy?
[Y] Yes [A] Yes to All [N] No [L] No to All [S] Suspend [?] Help (default is "N"): y
PS C:\Windows\system32> _
```

clj on Windows

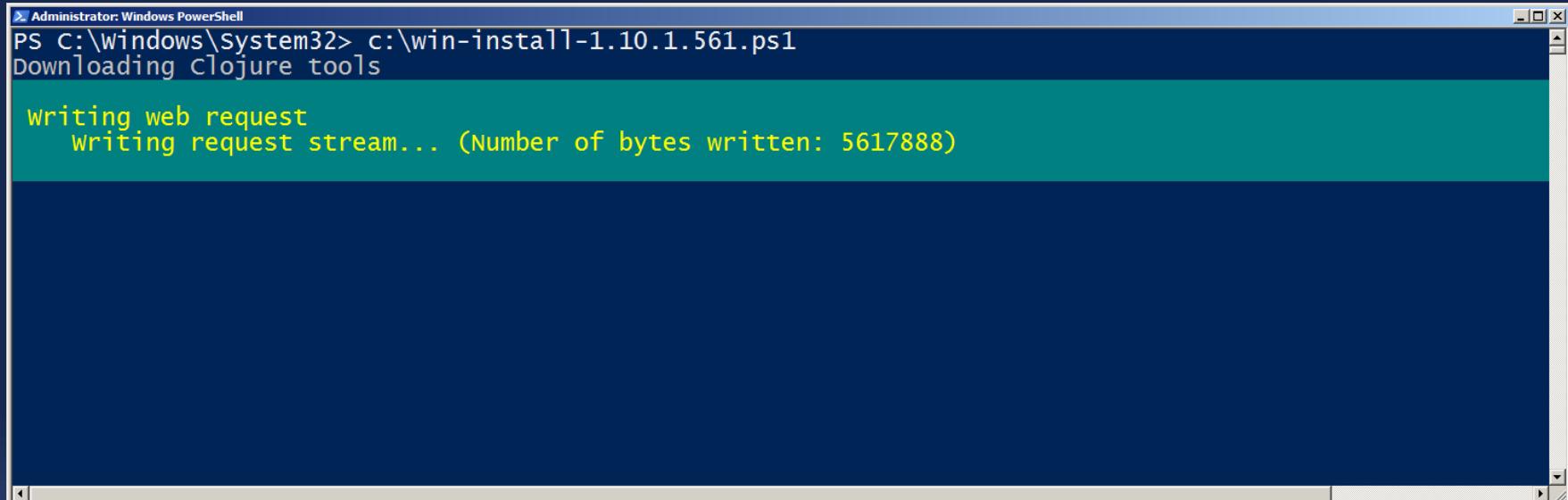
- ✓ Após baixar o instalador do clojure (**win-install-1.10.1.561.ps1**), executá-lo sob o Powershell, em modo administrador.



A screenshot of a Windows PowerShell window titled "Administrator: Windows PowerShell". The window shows the command "PS C:\Windows\System32> c:\win-install-1.10.1.561.ps1" entered at the prompt. The background of the slide is a dark blue gradient.

clj on Windows

- ✓ Após baixar o instalador do clojure (**win-install-1.10.1.561.ps1**), executá-lo sob o Powershell, em modo administrador.

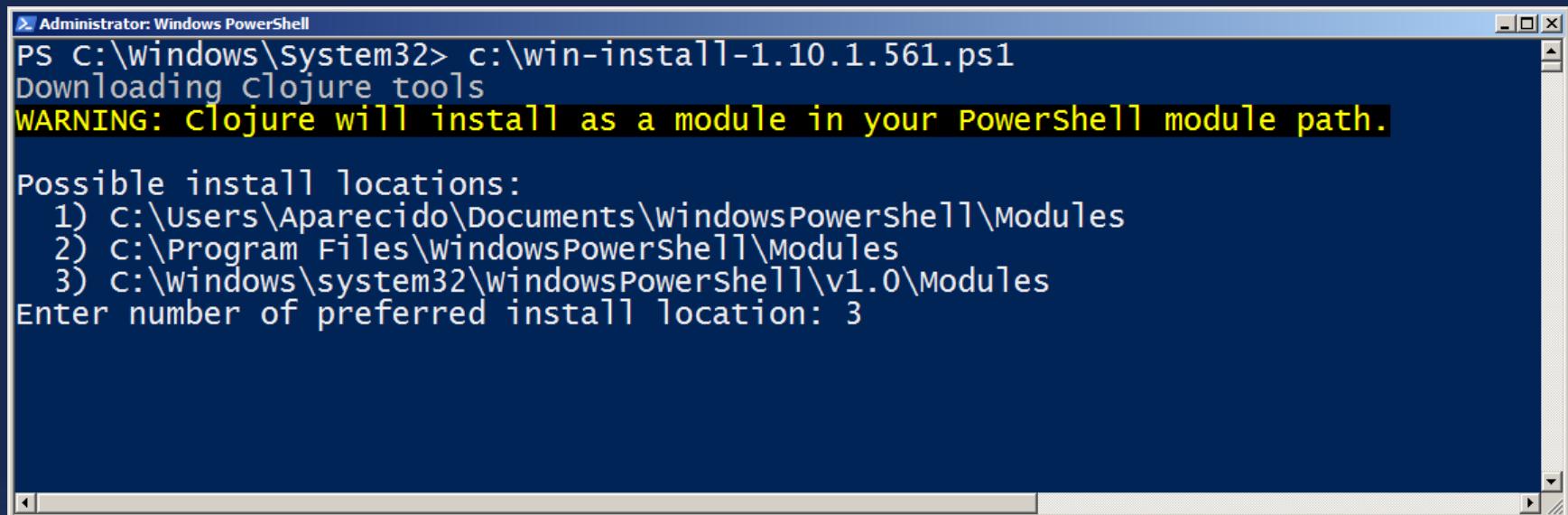


The screenshot shows an Administrator Windows PowerShell window. The command entered is `c:\win-install-1.10.1.561.ps1`. The output shows the script is downloading Clojure tools and then writing a web request, indicating the process is still ongoing.

```
Administrator: Windows PowerShell
PS C:\Windows\System32> c:\win-install-1.10.1.561.ps1
Downloading Clojure tools
Writing web request
Writing request stream... (Number of bytes written: 5617888)
```

clj on Windows

- ✓ Definir opção 3 => c:\Windows\system32\WindowsPowerShell.



```
Administrator: Windows PowerShell
PS C:\Windows\System32> c:\win-install-1.10.1.561.ps1
Downloading Clojure tools
WARNING: Clojure will install as a module in your PowerShell module path.

Possible install locations:
1) C:\Users\Aparecido\Documents\windowsPowershell\Modules
2) C:\Program Files\windowsPowershell\Modules
3) C:\windows\system32\windowsPowershell\v1.0\Modules
Enter number of preferred install location: 3
```

clj on Windows

- ✓ Clojure now installed. Use "clj-h" for help.

```
Administrator: Windows PowerShell
Downloading clojure tools
WARNING: Clojure will install as a module in your PowerShell module path.

Possible install locations:
 1) c:\Users\Aparecido\Documents\WindowsPowerShell\Modules
 2) c:\Program Files\WindowsPowerShell\Modules
 3) c:\windows\system32\WindowsPowerShell\v1.0\Modules
Enter number of preferred install location: 3

Cleaning up existing install
Installing PowerShell module
Removing download
Clojure now installed. use "clj -h" for help.
PS C:\windows\system32>
```



clj on Windows

```
> Administrator: Windows PowerShell
PS C:\Windows\System32> clj
clojure 1.10.1
user=> (println "Hello clojure")
Hello clojure
nil
user=> _
```



Executando fora do Powershell

- ✓ Sob **BASH**: `powershell -command clj`



```
MINGW64:/c/Users/Aparecido
Aparecido@Aparecido-PC MINGW64 ~
$ (powershell -command clj)
clojure 1.10.1
user=> |
```

Ativando cljs

- ✓ Sob prompt do Windows: **powershell -command cljs**



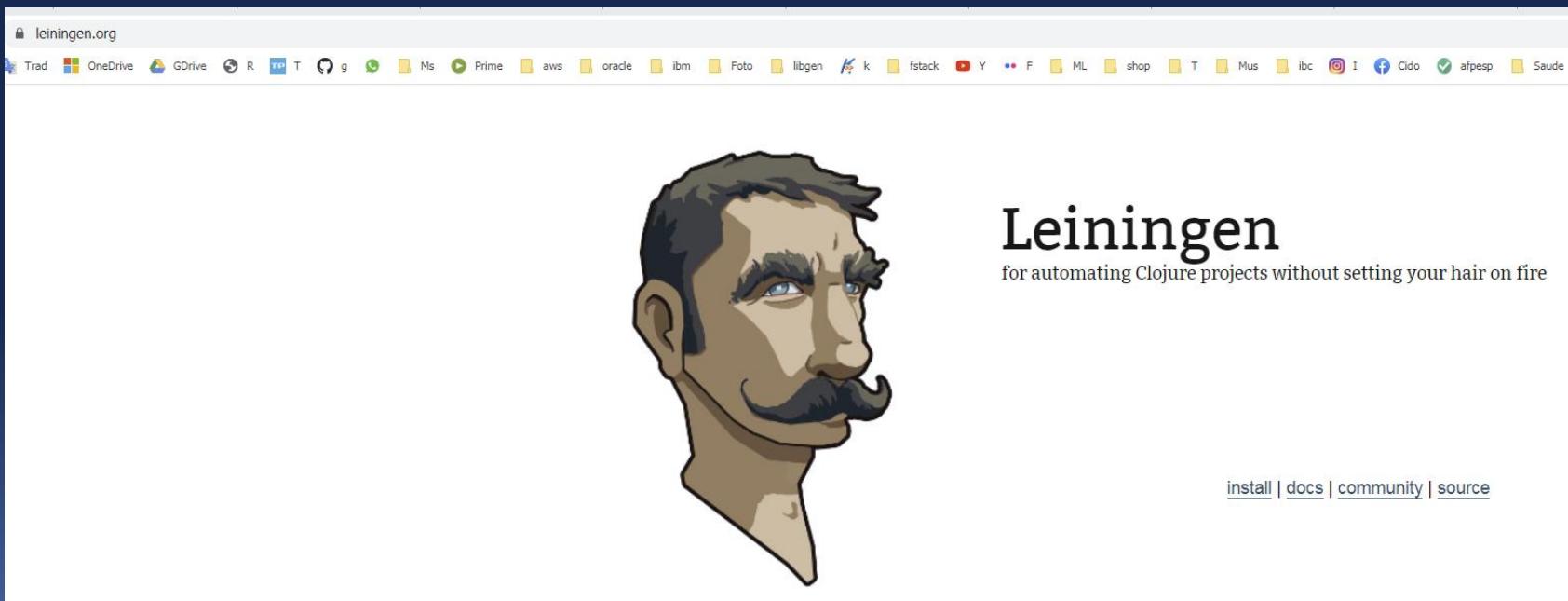
```
C:\Windows\system32\cmd.exe - powershell -command cljs
C:\>powershell -command cljs
clojure 1.10.1
user=>
```

Instalação com Leiningen



Leiningen – www.leiningen.org

- ✓ Leiningen é a forma mais simples de se usar a Linguagem Clojure;
- ✓ Ferramenta para se trabalhar com projetos Clojure;
- ✓ Foco na automação do projeto e configuração declarativa, permite que se foque na criação do código;



Leiningen - Install

Install

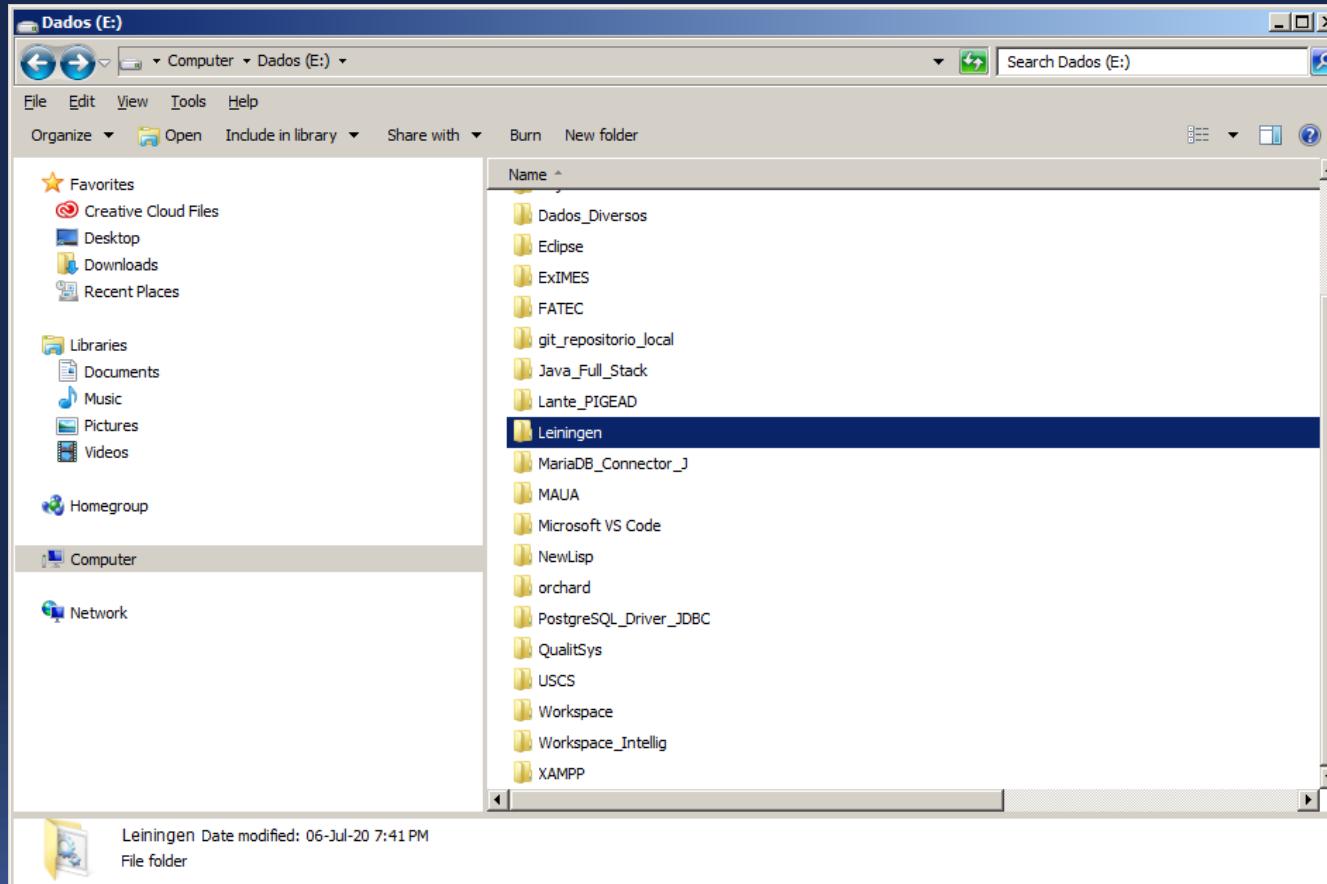
Leiningen and Clojure require Java. OpenJDK version 8 is recommended at this time.

1. Download the [lein script](#) (or on Windows [lein.bat](#))
2. Place it on your \$PATH where your shell can find it (eg. ~/bin)
3. Set it to be executable (`chmod a+x ~/bin/lein`)
4. Run it (`lein`) and it will download the self-install package

You can check your [package manager](#) as well..

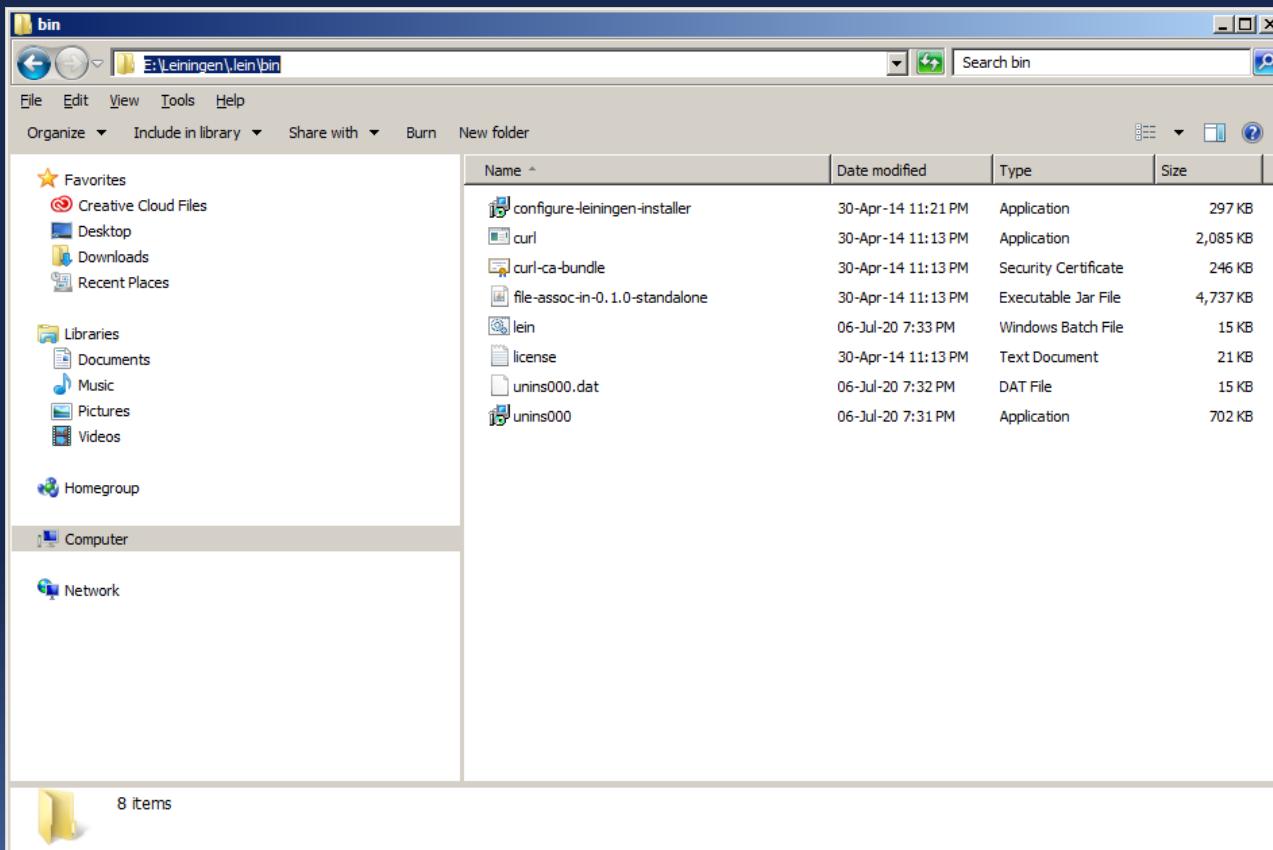
Leiningen - Install

- ✓ Criar pasta para Leiningen, download e execução do instalador



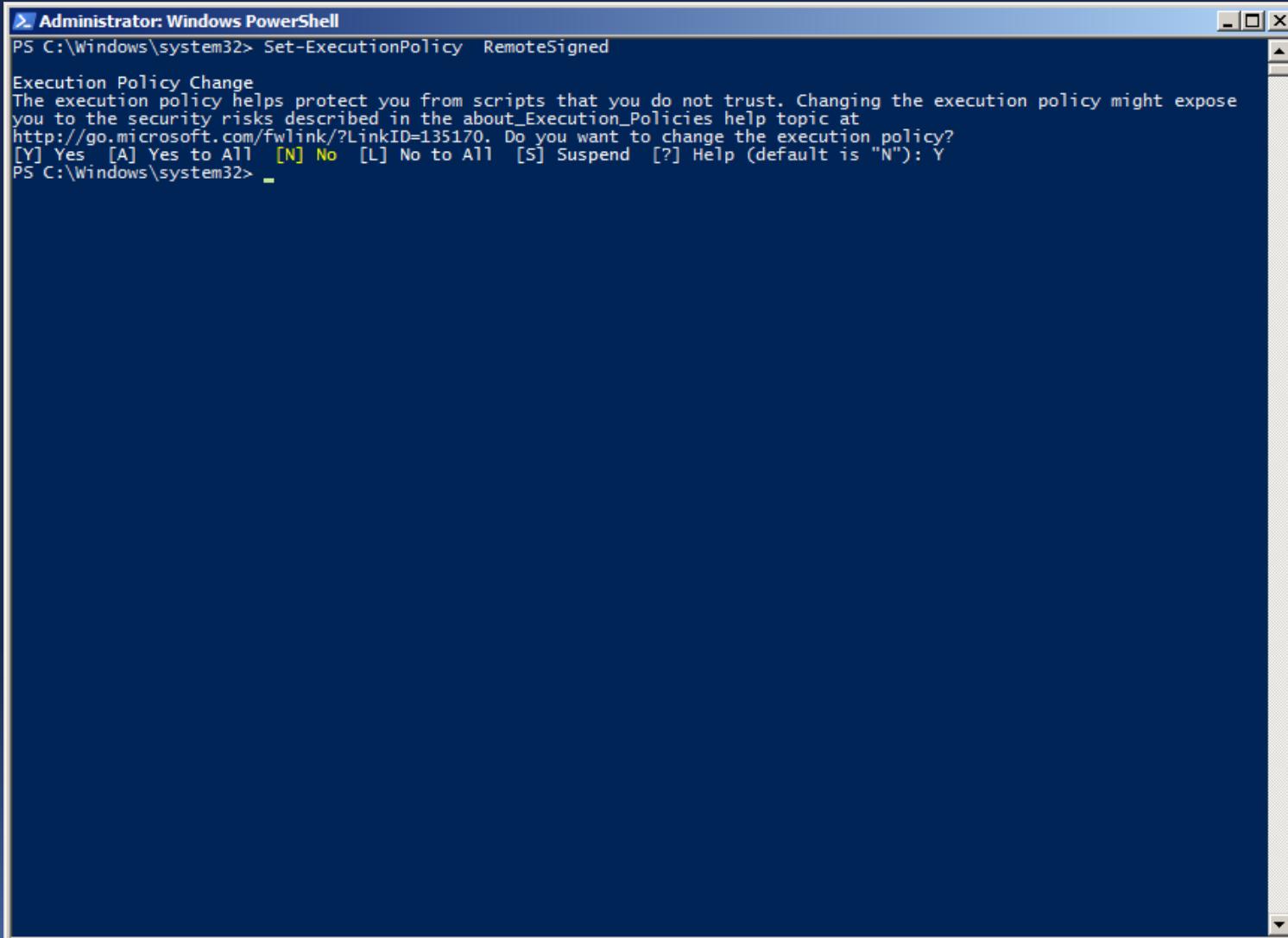
Leiningen - Install

- ✓ Criar pasta para **Leiningen**, download e execução do instalador;
- ✓ Executar o bat file: **lein.bat** (sob Powershell)



Habilitar PowerShell para execução

- ✓ No prompt do PowerShell: **Set-ExecutionPolicy RemoteSigned**



The screenshot shows an Administrator Windows PowerShell window titled "Administrator: Windows PowerShell". The command "PS C:\Windows\system32> Set-ExecutionPolicy RemoteSigned" is entered. A confirmation message about the execution policy change is displayed, stating: "Execution Policy Change. The execution policy helps protect you from scripts that you do not trust. Changing the execution policy might expose you to the security risks described in the about_Execution_Policies help topic at http://go.microsoft.com/fwlink/?LinkID=135170. Do you want to change the execution policy? [Y] Yes [A] Yes to All [N] No [L] No to All [S] Suspend [?] Help (default is "N")): Y". The user has responded with "Y".

Habilitar PowerShell para execução

- ✓ No prompt do PowerShell:

`Set-ExecutionPolicy -Scope Process -ExecutionPolicy Bypass`

Fix for PowerShell Script Not Digitally Signed



Caio Moreno [Follow](#)

Jul 15, 2019 · 1 min read



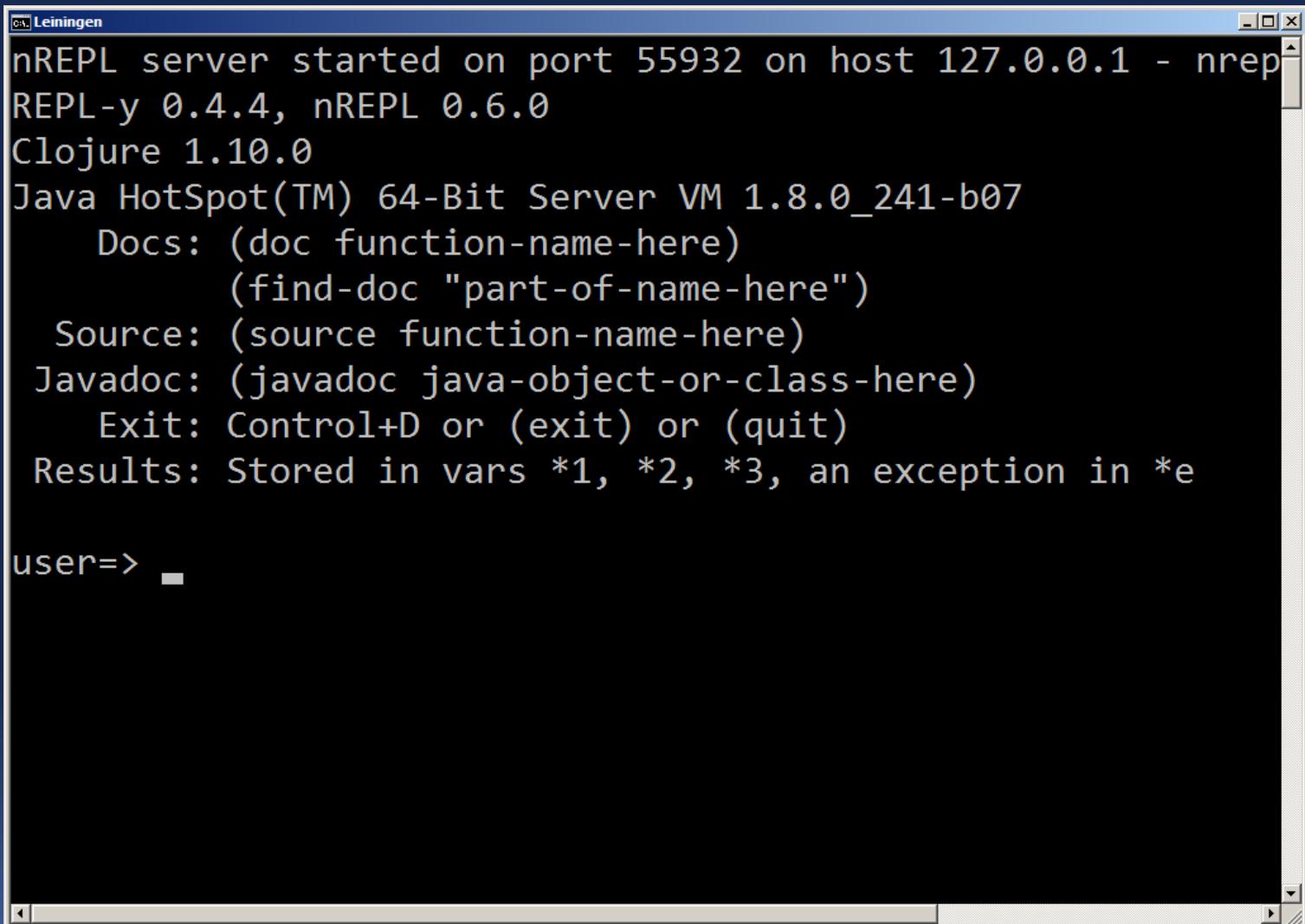
When you run a .ps1 PowerShell script you might get the message saying
“**.ps1 is not digitally signed. The script will not execute on the system.**”

To fix it you have to run the command below to run Set-ExecutionPolicy and change the Execution Policy setting.

```
Set-ExecutionPolicy -Scope Process -ExecutionPolicy Bypass
```

This command sets the execution policy to bypass for only the current PowerShell session after the window is closed, the next PowerShell session will open running with the default execution policy. “Bypass” means nothing is blocked and no warnings, prompts, or messages will be displayed.

Leiningen - nREPL

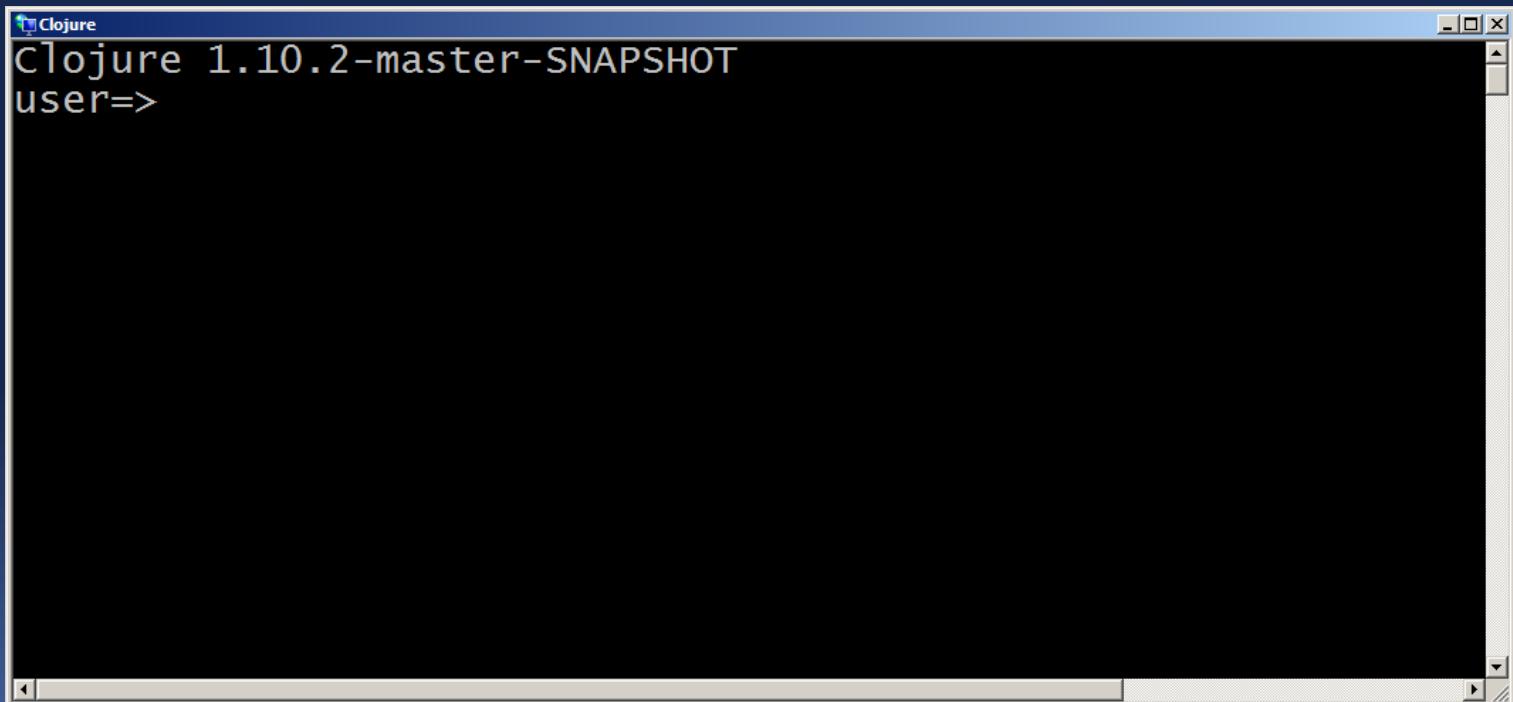


```
nREPL server started on port 55932 on host 127.0.0.1 - nrepl
REPL-y 0.4.4, nREPL 0.6.0
Clojure 1.10.0
Java HotSpot(TM) 64-Bit Server VM 1.8.0_241-b07
  Docs: (doc function-name-here)
        (find-doc "part-of-name-here")
  Source: (source function-name-here)
Javadoc: (javadoc java-object-or-class-here)
  Exit: Control+D or (exit) or (quit)
Results: Stored in vars *1, *2, *3, an exception in *e

user=> ■
```

Usando REPL

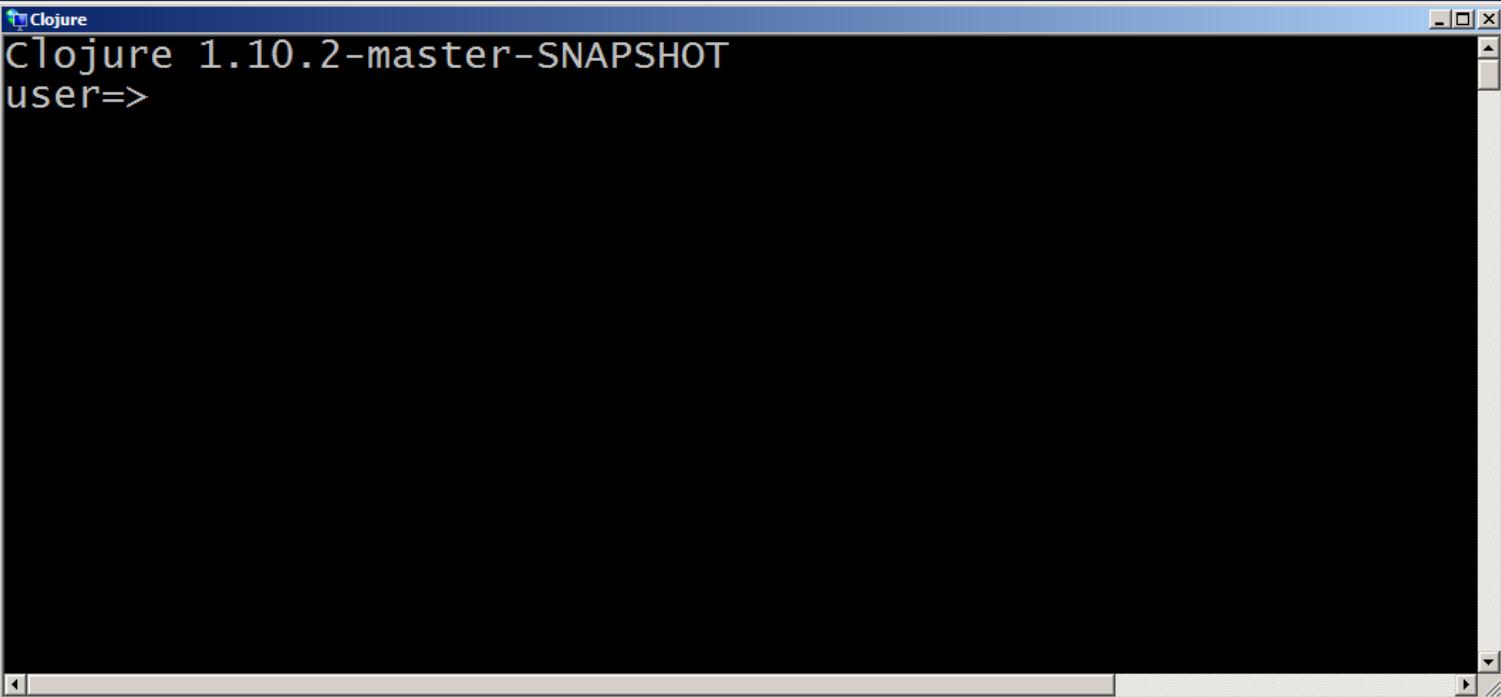
- ✓ REPL significa **READ EVAL PRINT LOOP** e representa um bom recurso para iniciar o estudo de **Clojure**;
- ✓ É uma **interface de comandos** que permite a avaliação direta de código **Clojure**;
- ✓ No prompt do REPL, a primeira linha representa a **versão** do **Clojure**, o qual em nosso caso é a **1.10.2**;



A screenshot of a Windows-style application window titled "Clojure". The title bar also shows "Clojure 1.10.2-master-SNAPSHOT". The main area of the window is a black terminal-like interface. At the top left, it displays the text "user=>". There is no other text or input visible in the window.

Usando REPL

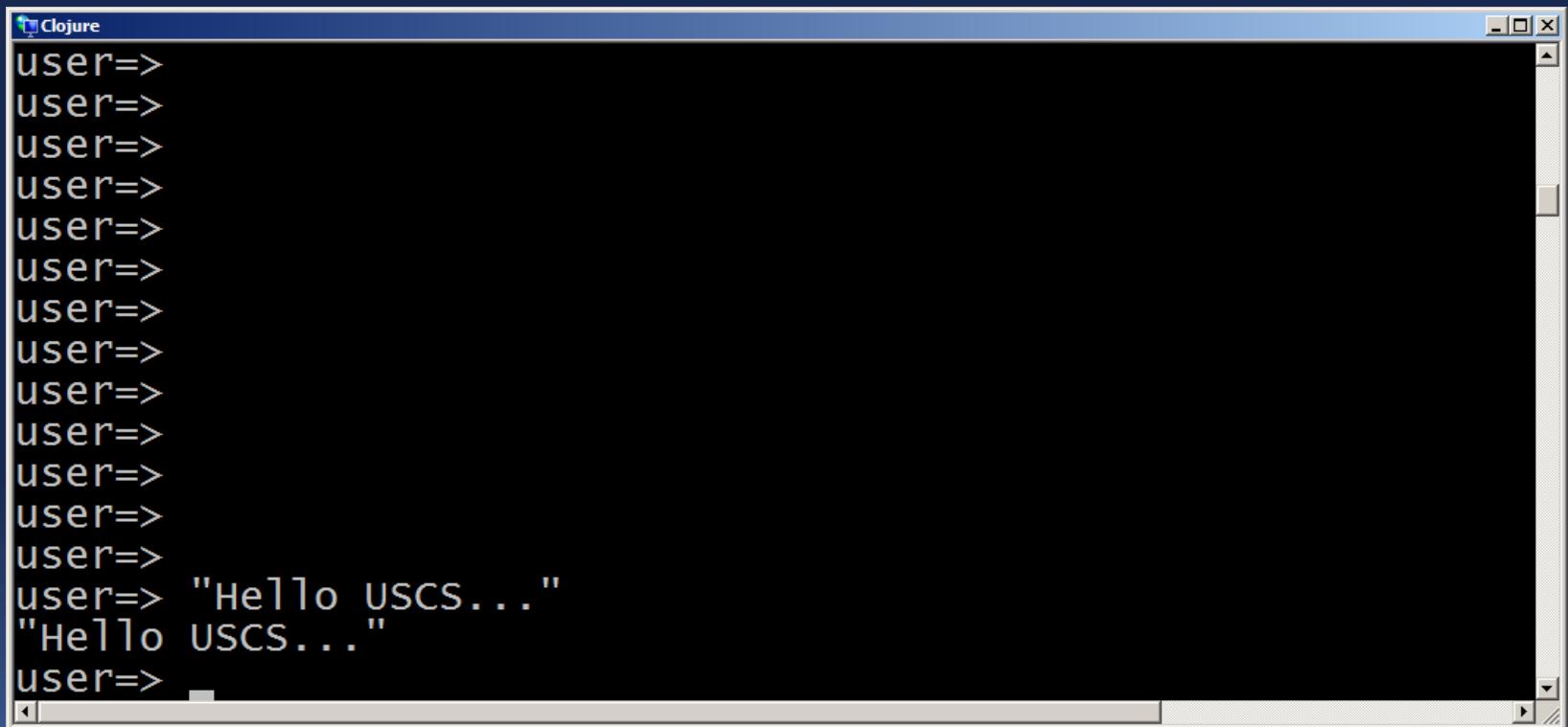
- ✓ A segunda linha exibe o **namespace** corrente (**user**) e solicita input do usuário;
- ✓ Um **namespace** é um grupo de coisas (tais como funções) que estão agrupadas em um espaço;
- ✓ Aqui, nesse caso, tudo que for criado estará no **namespace user** por default;
- ✓ **REPL** está agora pronto (**ready**).



Clojure 1.10.2-master-SNAPSHOT
user=>

Avaliando expressões

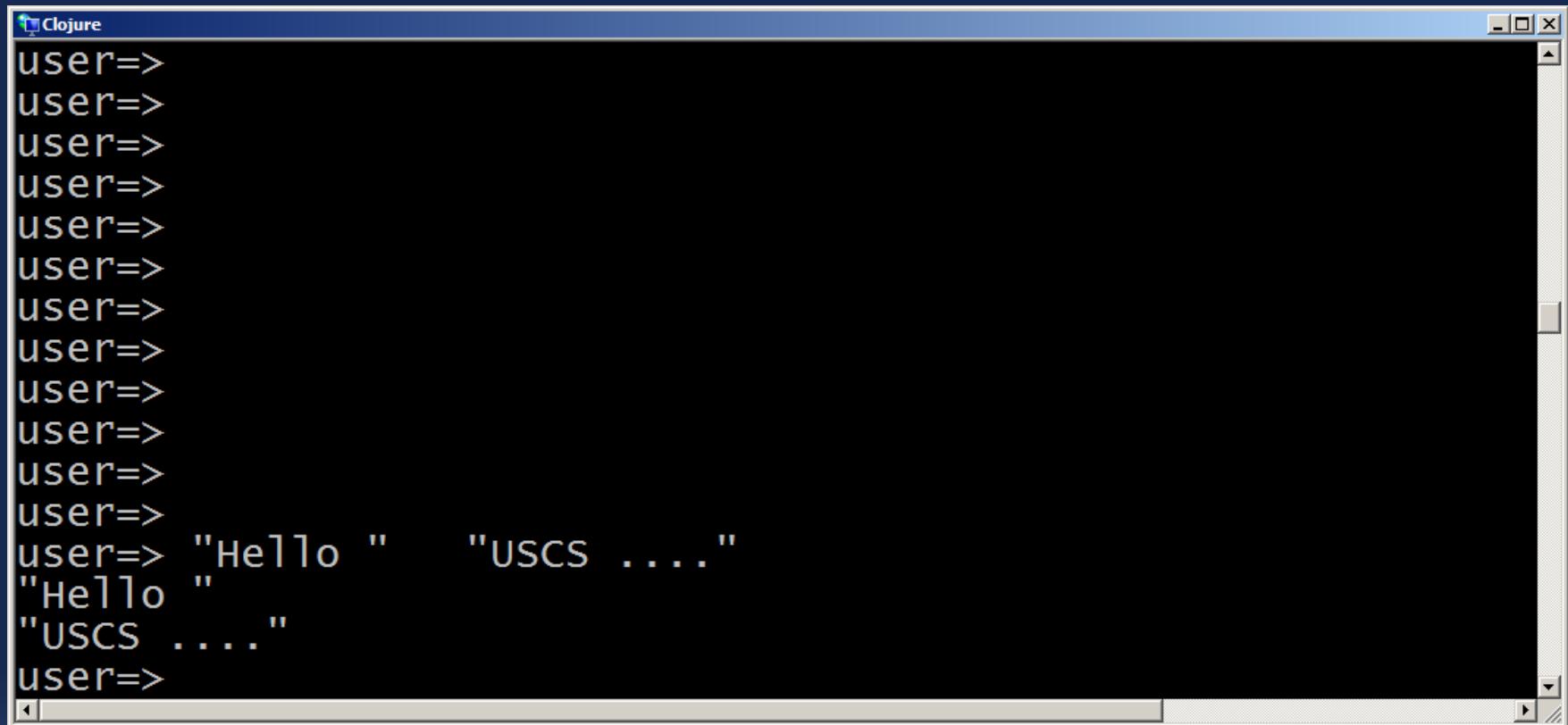
- ✓ Em **Clojure**, **literais string** são criados com aspas duplas, " " ;
- ✓ Um **literal** é uma notação para representar valores **fixos** no código fonte.



The screenshot shows a terminal window titled "Clojure" with a blue header bar. The window contains the following text:

```
user=>
user=> "Hello USCS..."
"Hello USCS..."
user=>
```

Avaliando múltiplos strings

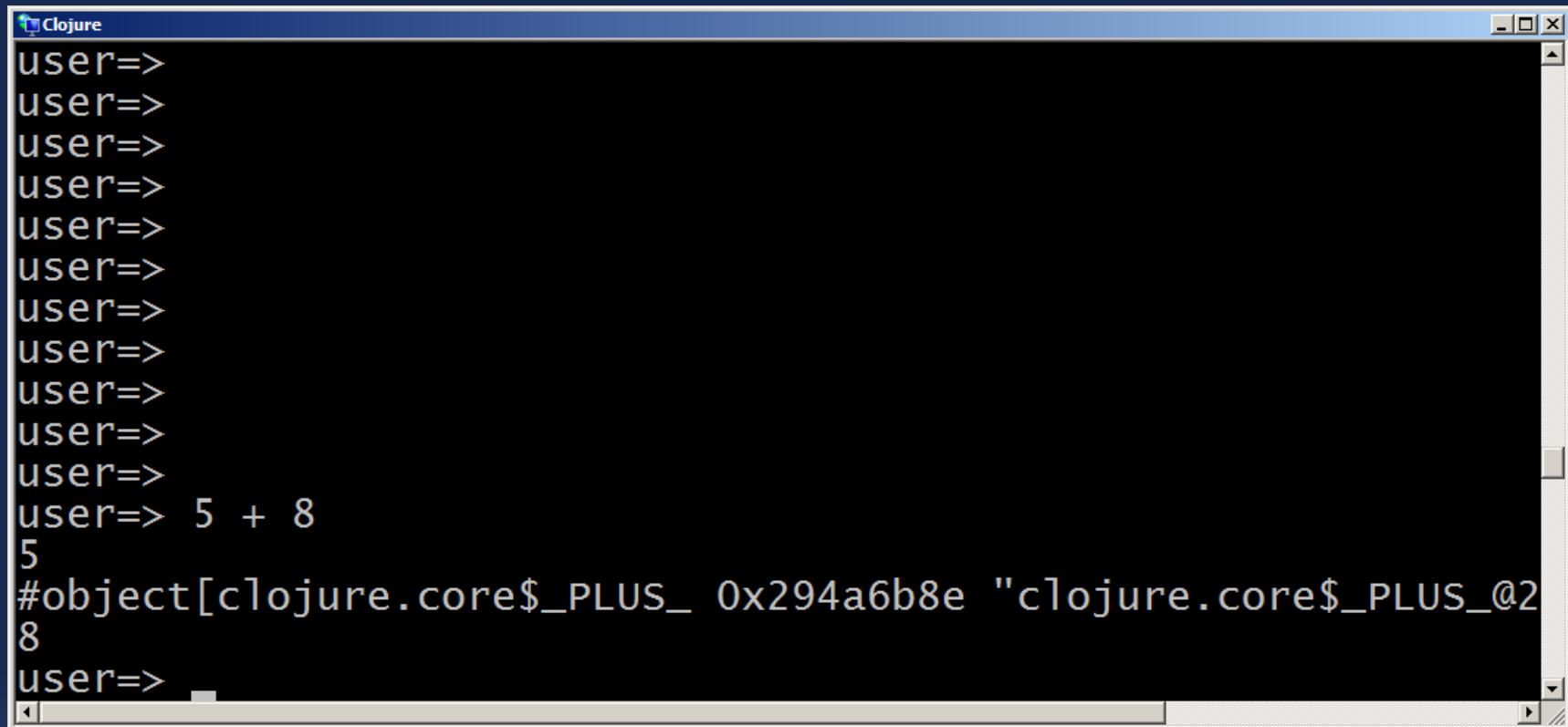


The screenshot shows a Windows-style application window titled "Clojure". Inside, the Clojure REPL is running. The user has entered several expressions, each consisting of a string followed by a space and a multi-line string. The REPL has evaluated each expression sequentially, returning the first part of each expression on one line and the second part on the next line. This demonstrates how Clojure handles multiple expressions in a single input line.

```
user=>
user=> "Hello "    "USCS ...."
"Hello "
"USCS ...."
user=>
```

- ✓ Nesse exemplo, **duas** expressões **string** foram avaliadas sequencialmente, e cada qual foi **retornada** em duas linhas separadas;

Avaliando expressões aritméticas

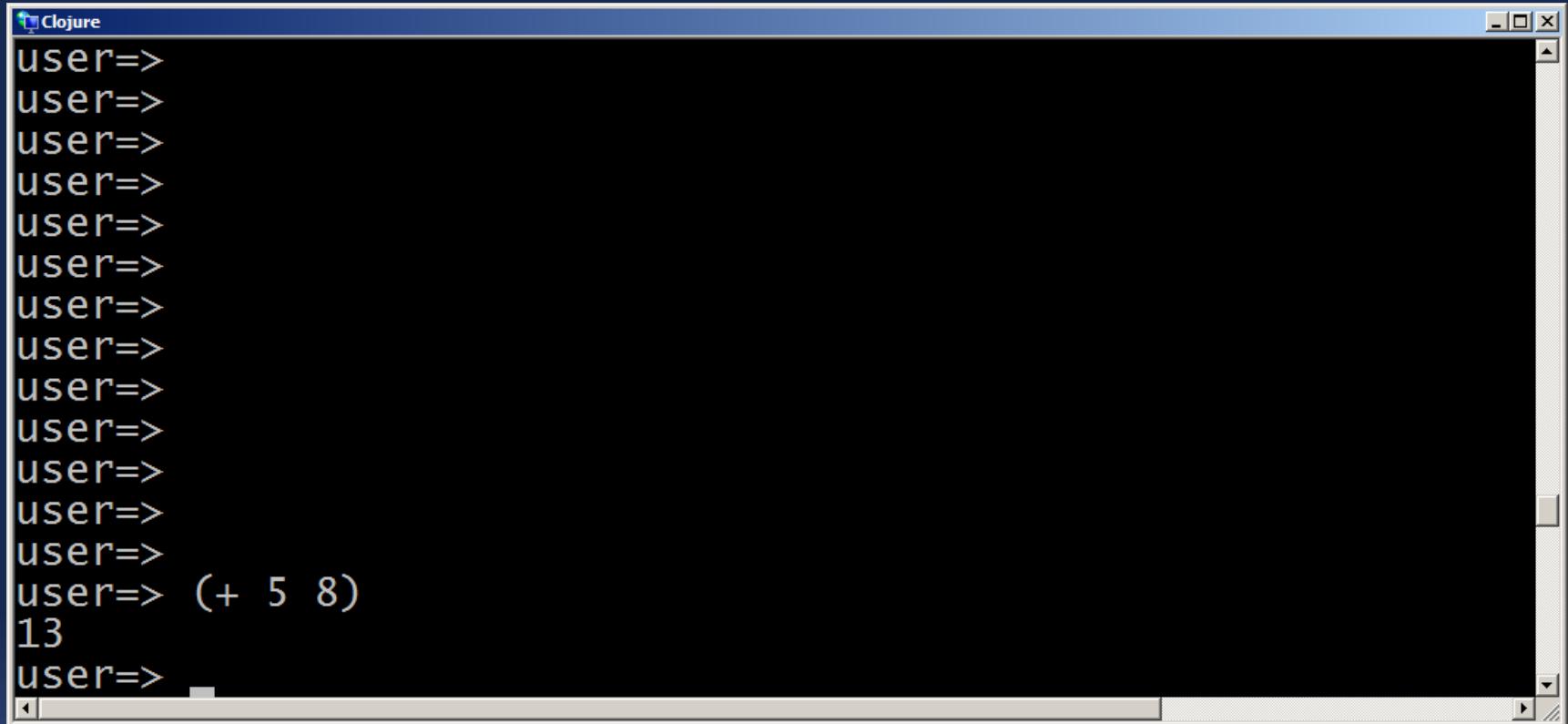


The screenshot shows a Windows-style application window titled "Clojure". The main pane displays the following Clojure interaction:

```
user=>
user=> 5 + 8
5
#object[clojure.core$PLUS_ 0x294a6b8e "clojure.core$PLUS_@2
8
user=>
```

- ✓ Clojure retornou **erro**, pois o primeiro argumento deve ser uma **função**. No caso, o símbolo **+** está ligado (**bounded**) à uma função e deve ser o primeiro elemento da lista a ser avaliada, seguido pelos operandos (**argumentos**).

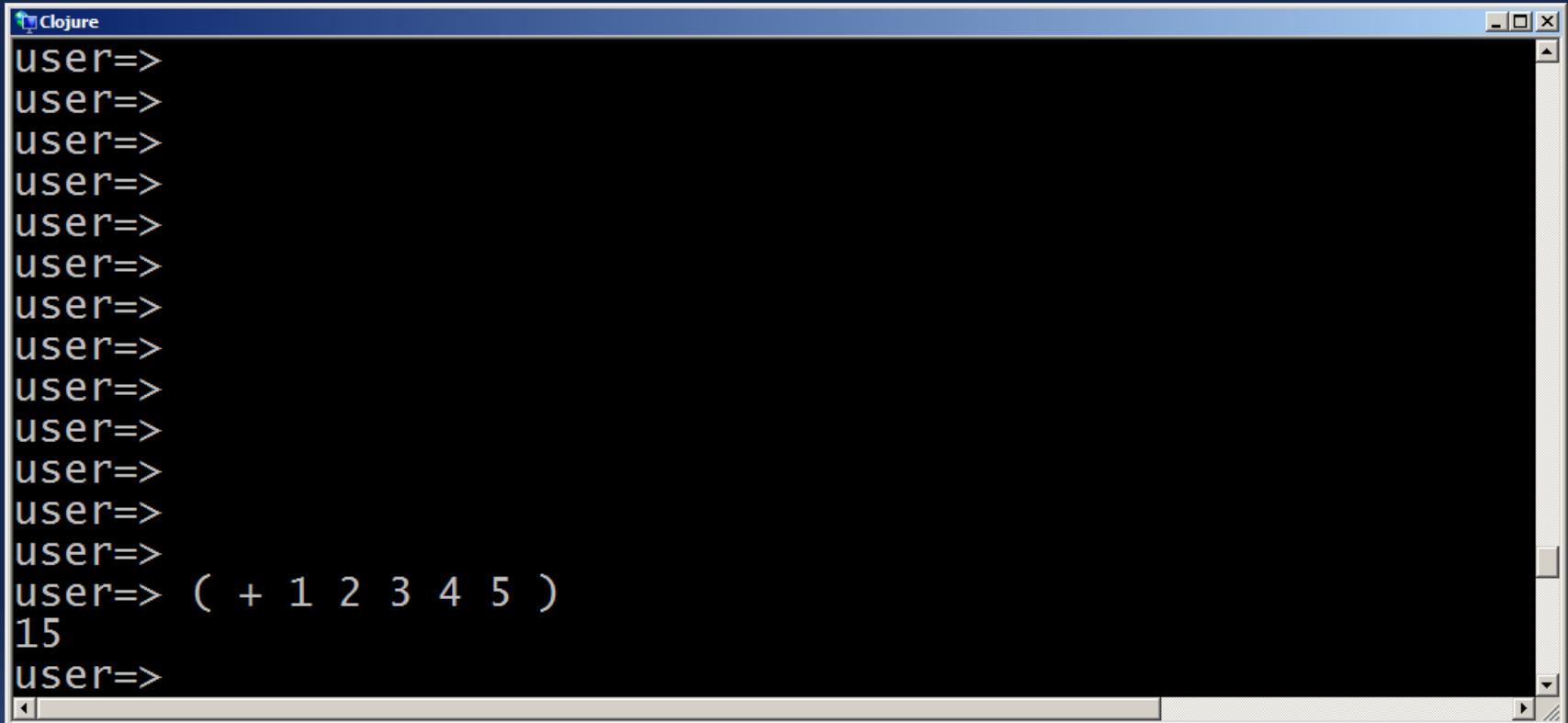
Avaliando expressões aritméticas



The screenshot shows a Windows-style window titled "Clojure". Inside, the Clojure REPL is running. The session starts with several "user=>" prompts, followed by the evaluation of the expression `(+ 5 8)`, which results in the value `13`. The REPL prompt then changes to `user=> [REPL bar]`.

```
Clojure
user=>
user=> (+ 5 8)
13
user=> [REPL bar]
```

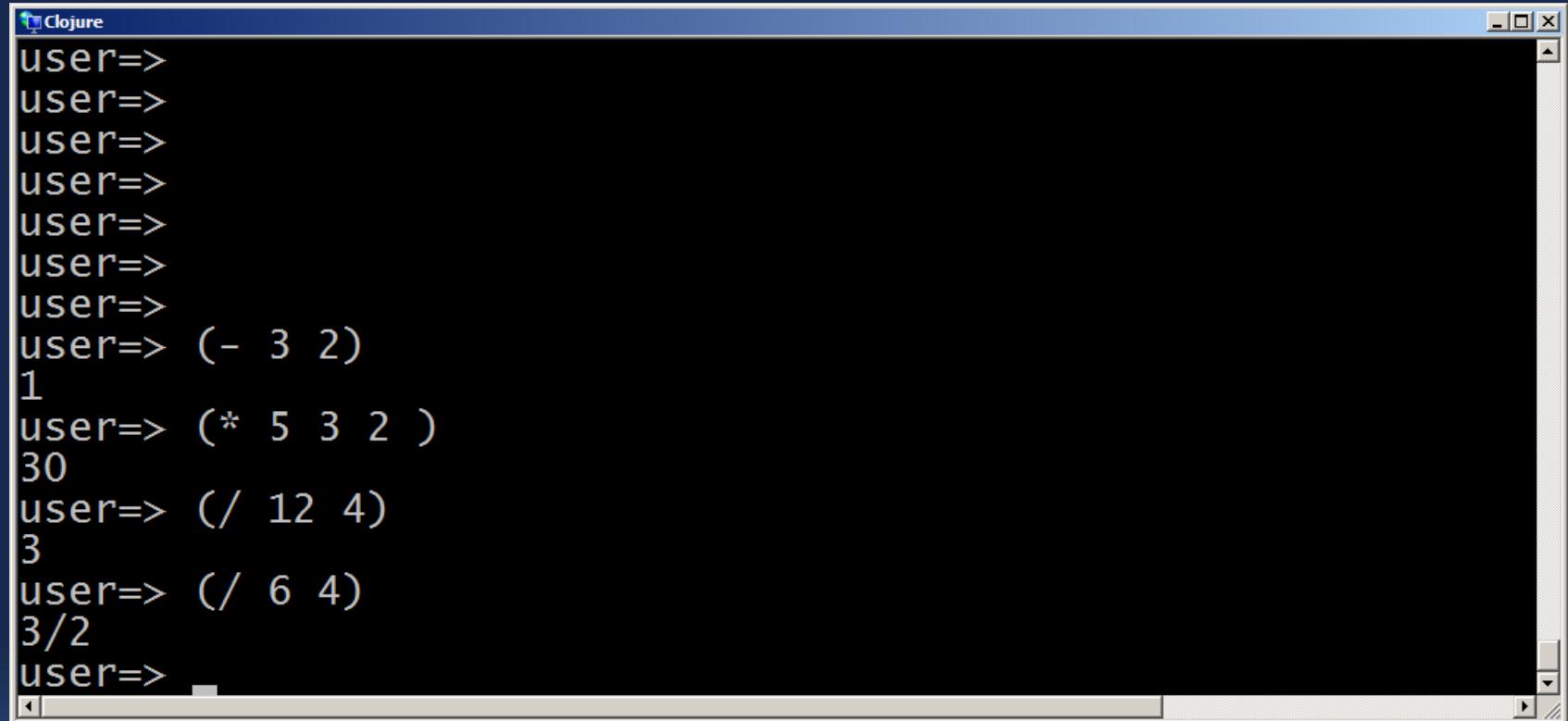
Avaliando expressões aritméticas



The screenshot shows a Windows-style application window titled "Clojure". Inside the window, the Clojure REPL is running. The user has entered the expression "(+ 1 2 3 4 5)". The REPL has evaluated this expression and returned the result "15". The window has standard window controls (minimize, maximize, close) and scroll bars on the right side.

```
user=>
user=> ( + 1 2 3 4 5 )
15
user=>
```

Avaliando expressões aritméticas



The screenshot shows a Windows-style application window titled "Clojure". Inside, a Clojure REPL session is running, displaying the following interactions:

```
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=> (- 3 2)
1
user=> (* 5 3 2 )
30
user=> (/ 12 4)
3
user=> (/ 6 4)
3/2
user=>
```

Função println

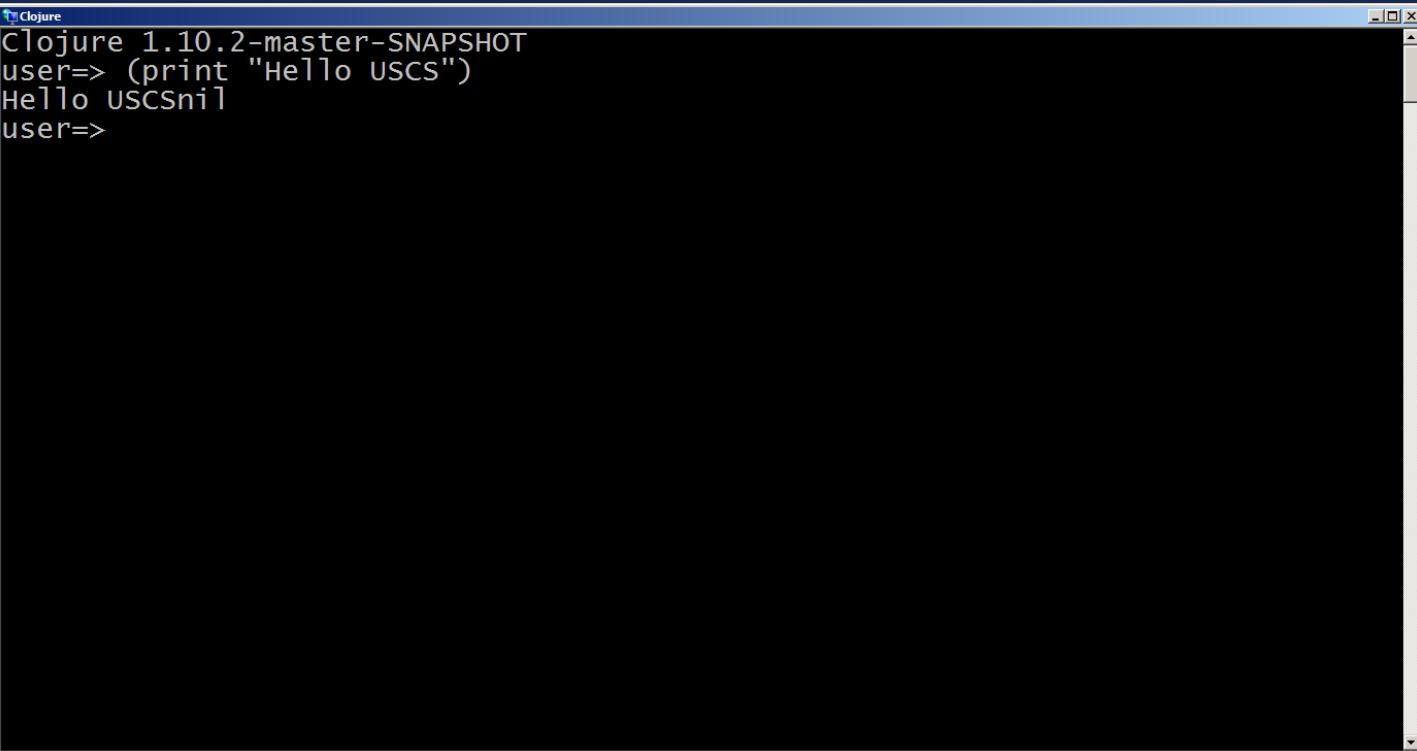


```
Clojure 1.10.2-master-SNAPSHOT
user=> (println "Hello USCS....")
Hello USCS....
nil
user=>
```

- ✓ O texto impresso pela função **println** foi um **SIDE EFFECT**;
- ✓ A função na verdade **retornou nil**.

nil

- ✓ Equivale em **Clojure** a um valor “**null**” ou “**nada**”;
- ✓ Ou seja, trata-se da **ausência de significado**;
- ✓ As funções **print** e **println** são usadas para imprimir objetos para a saída padrão e retornam **nil** uma vez que a impressão foi efetivada;



```
Clojure 1.10.2-master-SNAPSHOT
user=> (print "Hello USCS")
Hello USCSnil
user=>
```

Funções nested

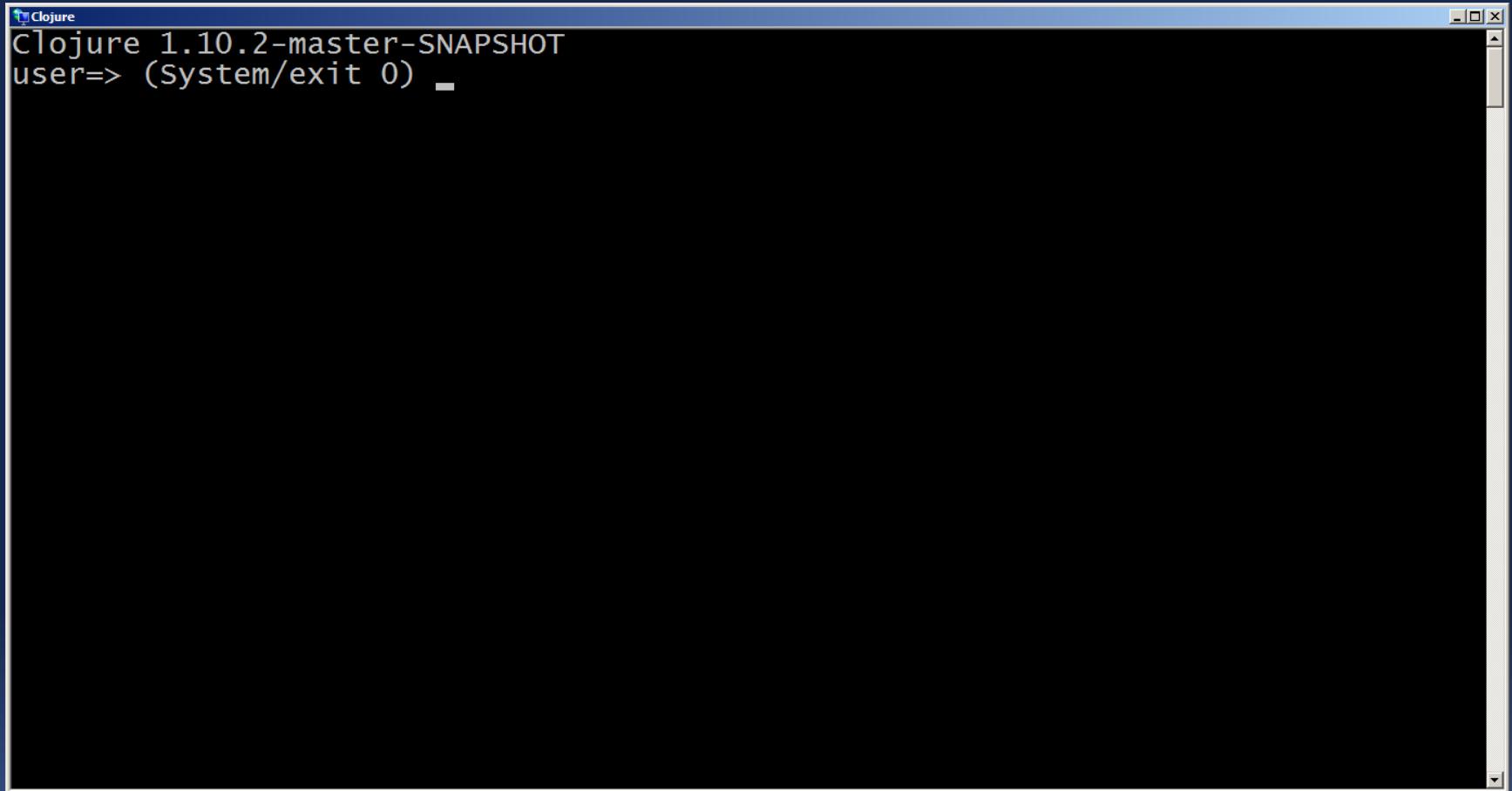


The screenshot shows a Clojure REPL window titled "Clojure". The session starts with the prompt "user=>". The user enters a nested arithmetic expression: "(+ (* 3 2) (- 5 3))". The result, "8", is displayed. The session then continues with another "user=>" prompt.

```
Clojure 1.10.2-master-SNAPSHOT
user=> (+ (* 3 2) (- 5 3))
8
user=>
```

Exit REPL

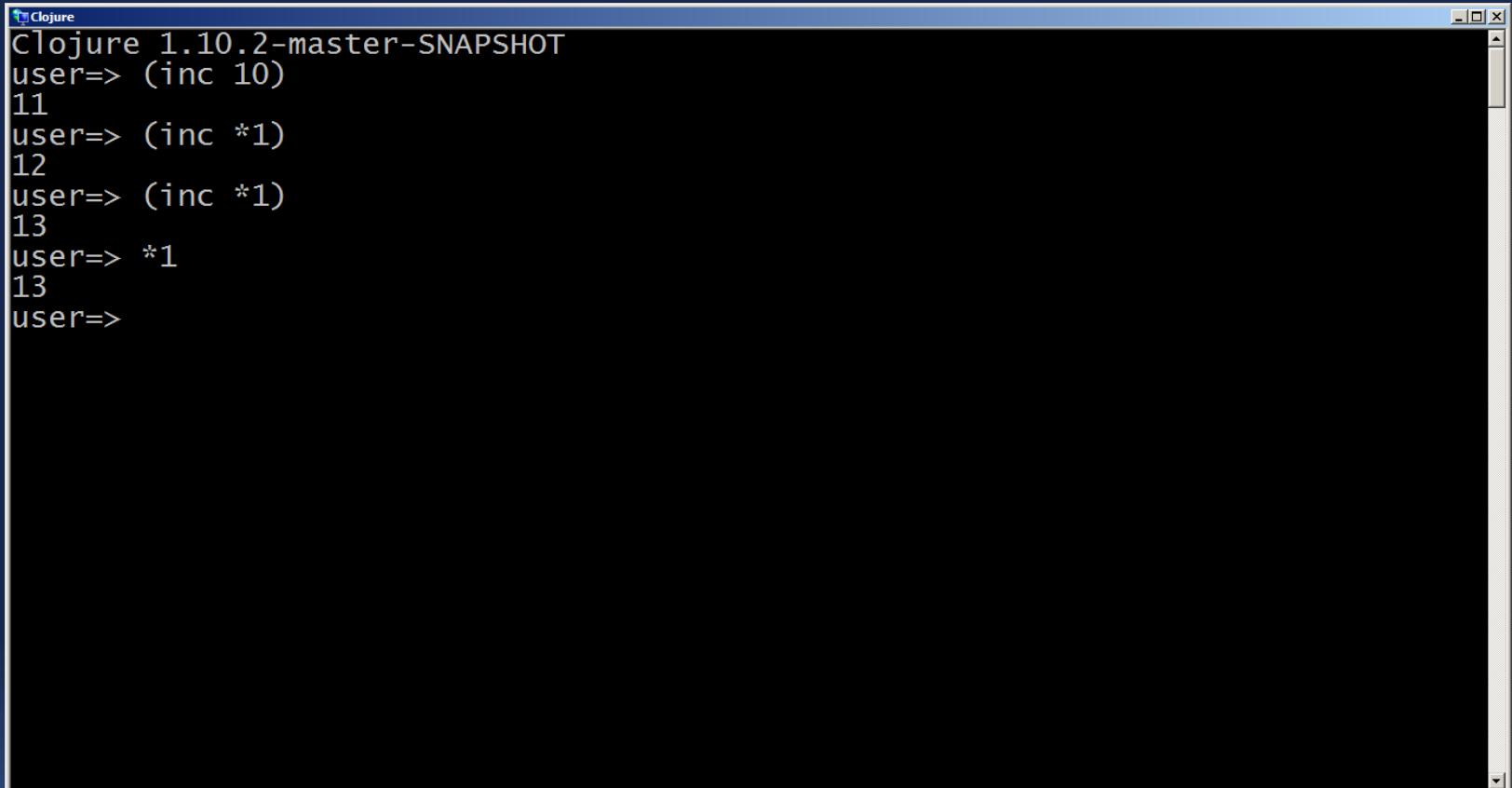
(System/exit 0)



A screenshot of a terminal window titled "Clojure". The window shows the command `(System/exit 0)` being typed at the prompt. The window has a standard Windows-style title bar and scroll bars.

```
Clojure 1.10.2-master-SNAPSHOT
user=> (System/exit 0) -
```

Operando com a última expressão avaliada => *1



The screenshot shows a terminal window titled "Clojure" running on "Clojure 1.10.2-master-SNAPSHOT". The user has entered the following sequence of commands:

```
Clojure 1.10.2-master-SNAPSHOT
user=> (inc 10)
11
user=> (inc *1)
12
user=> (inc *1)
13
user=> *1
13
user=>
```

The output shows the result of each increment operation and the final value of the variable *1, which is 13.

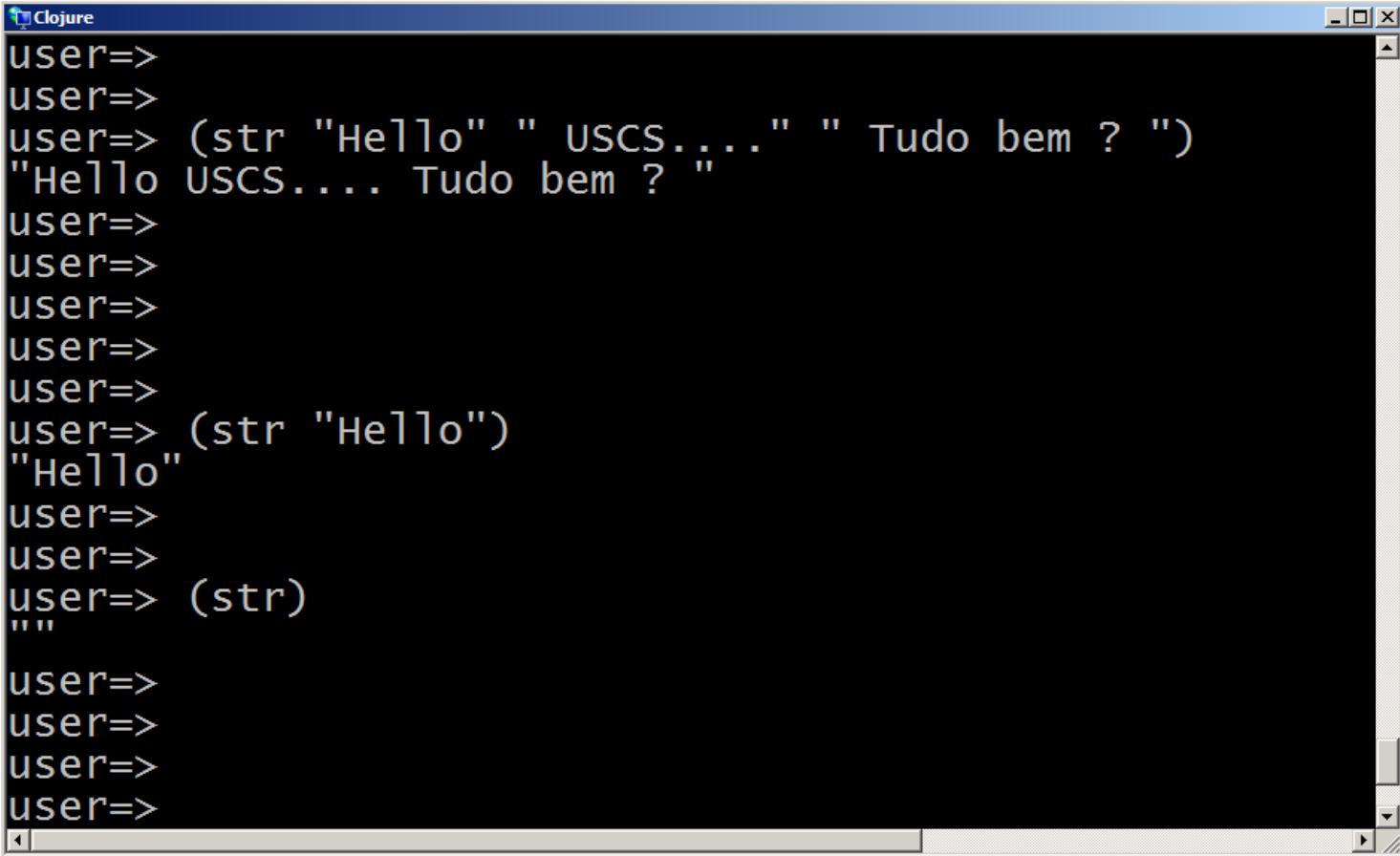
Operando com a variável que contém o resultado da última exceção => *e

```
Clojure
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=> (/ 1 0)
Execution error (ArithmetricException) at user/eval17 (REPL:1).
Divide by zero
user=>
user=>
user=>
user=>
user=> *e
#error {
  :cause "Divide by zero"
  :via
  [{:type java.lang.ArithmetricException
    :message "Divide by zero"
    :at [clojure.lang.Numbers divide "Numbers.java" 188]}]
  :trace
  [[clojure.lang.Numbers divide "Numbers.java" 188]
   [clojure.lang.Numbers divide "Numbers.java" 3901]
   [user$eval17 invokeStatic "NO_SOURCE_FILE" 1]
   [user$eval17 invoke "NO_SOURCE_FILE" 1]]
```



Concatenando Strings – str

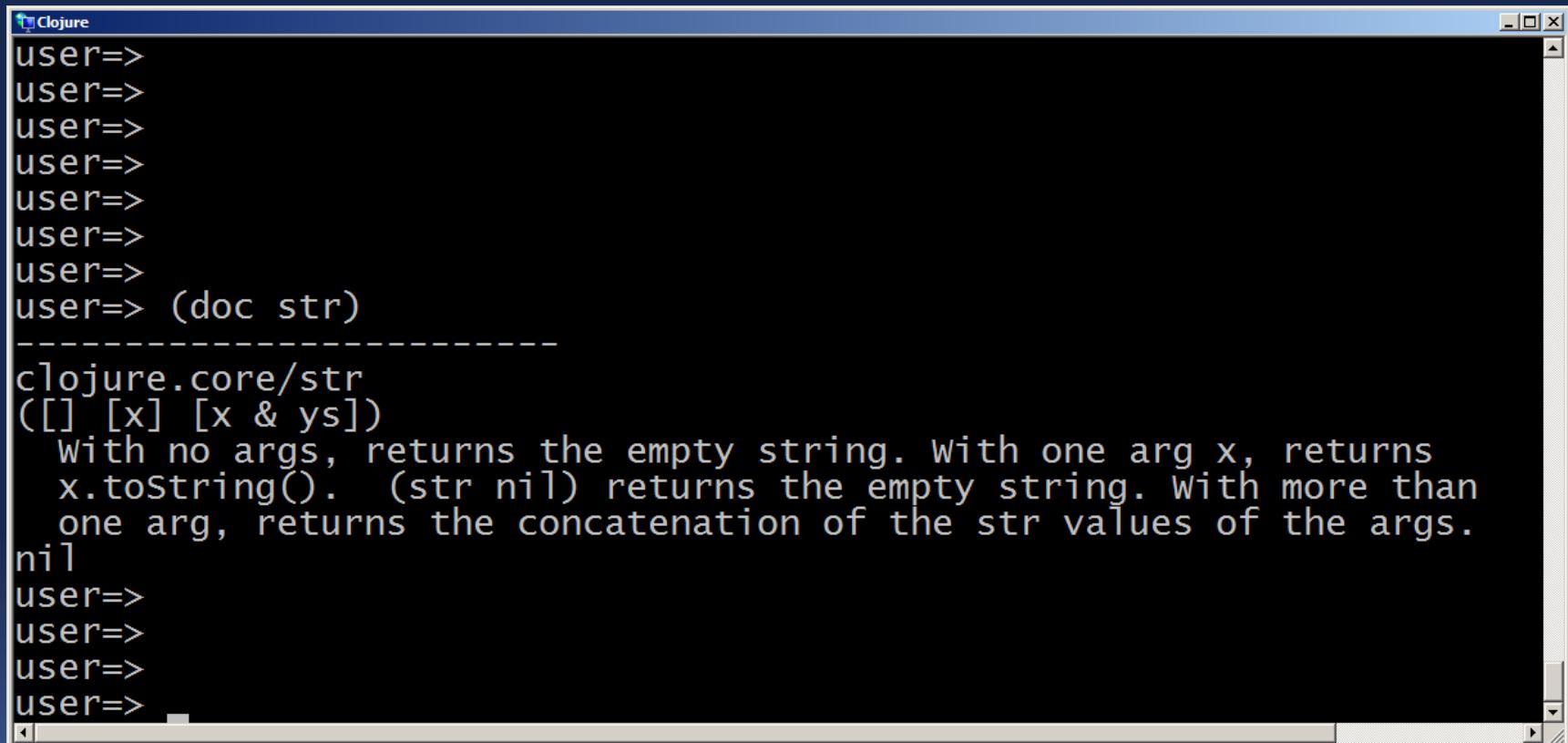
- ✓ A função **str** sem parâmetros retorna o String **nulo** ("")
- ✓ Com um argumento **x** retorna **x.toString()**:
- ✓ Com **mais de um argumento** **x...y** retorna a **concatenação** desses argumentos !



```
Clojure
user=>
user=>
user=> (str "Hello" " USCS...." " Tudo bem ? ")
"Hello USCS.... Tudo bem ? "
user=>
user=>
user=>
user=>
user=>
user=>
user=> (str "Hello")
"Hello"
user=>
user=>
user=> (str)
""
user=>
user=>
user=>
user=>
```

Função doc

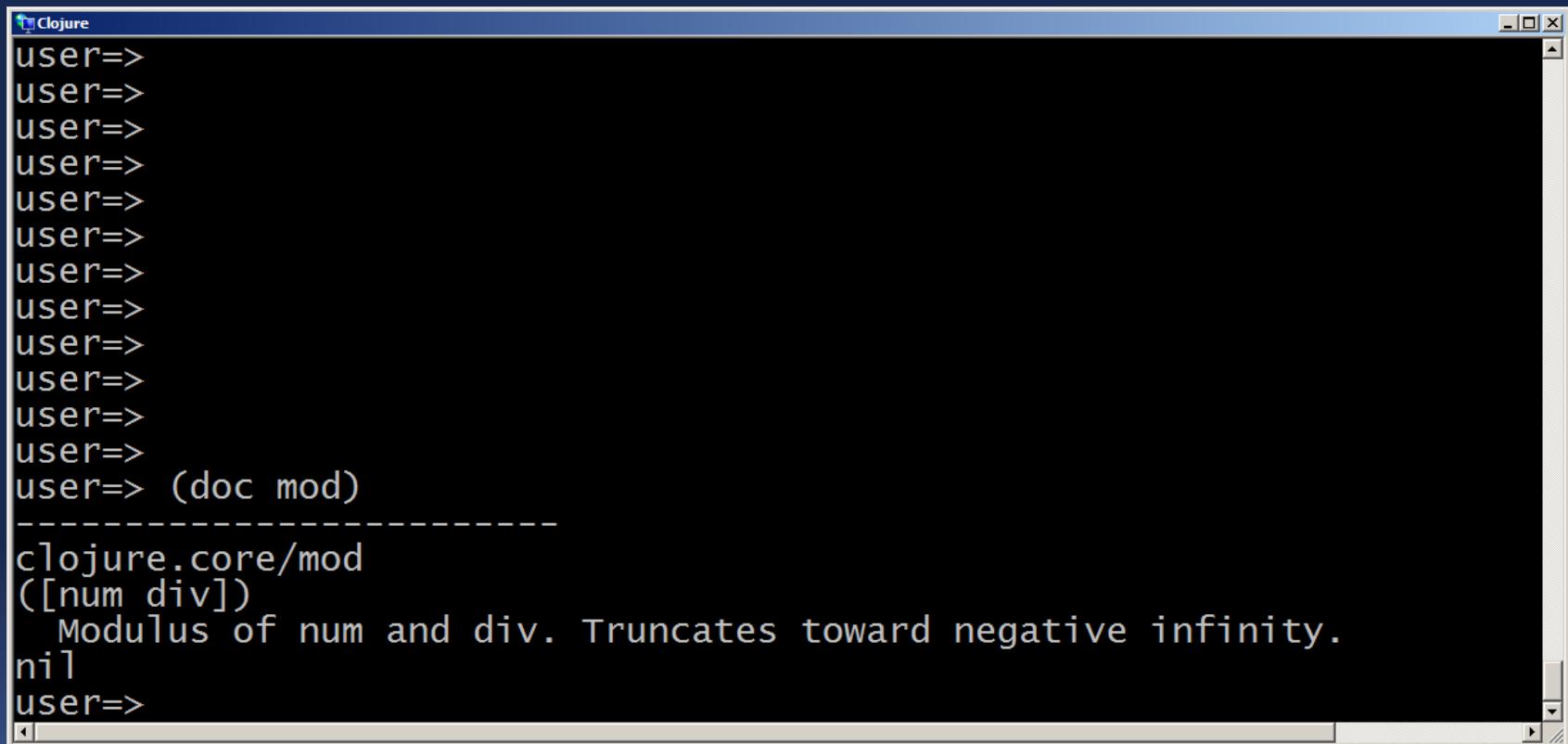
- ✓ A função **doc** permite que se pesquise a **documentação** através de **REPL**;
- ✓ Dado que se conhece o nome da função que se quer usar, pode-se ler a documentação desta função por meio da função **doc**.
- ✓ Exemplo; Obtenção da documentação da função **str**:



```
Clojure
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=> (doc str)
-----
clojure.core/str
([] [x] [x & ys])
With no args, returns the empty string. With one arg x, returns
x.toString(). (str nil) returns the empty string. With more than
one arg, returns the concatenation of the str values of the args.
nil
user=>
user=>
user=>
user=>
```

Função doc

- ✓ Exibe o nome completamente qualificado da função (incluindo o **namespace**) na **primeira linha**, os possíveis **parâmetros** (ou “aridades”) na próxima linha e finalmente a descrição da função que se está pesquisando.
- ✓ Exemplo: **(doc mod)**

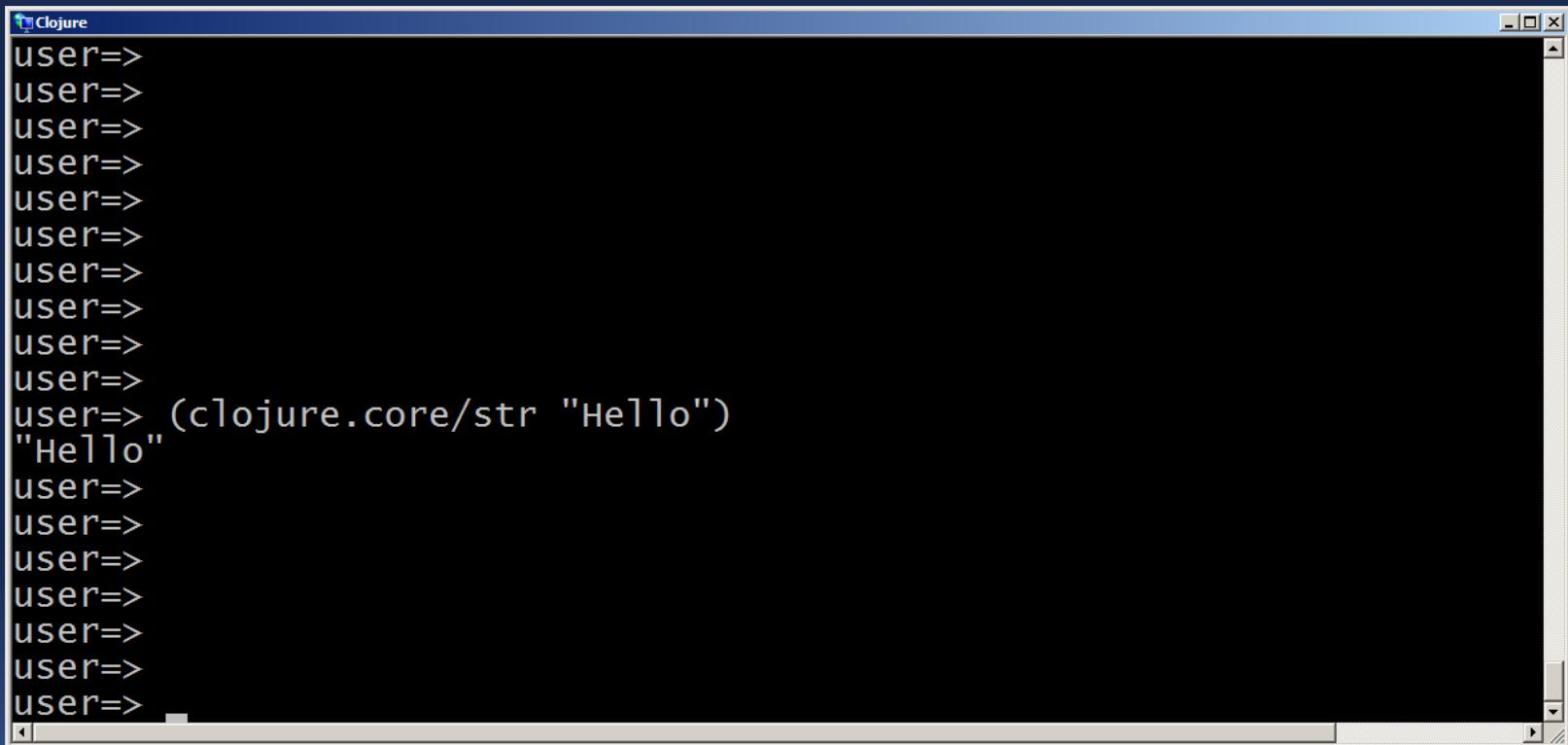


The screenshot shows a terminal window titled "Clojure". The user has entered the command "(doc mod)". The output is as follows:

```
user=>
user=> (doc mod)
-----
clojure.core/mod
([num div])
  Modulus of num and div. Truncates toward negative infinity.
nil
user=>
```

clojure.core

- ✓ Tudo o que está definido em `clojure.core` estará disponível ao seu `namespace` corrente por `default`, dispensando-se assim de se explicitamente requerê-la;
- ✓ Por exemplo: `(str "hello")` ao invés de `(clojure.core/str "hello")`



The screenshot shows a Windows-style application window titled "Clojure". Inside the window, the Clojure REPL is running. The history of input and output is as follows:

```
user=>
user=> (clojure.core/str "Hello")
>Hello
user=>
user=>
user=>
user=>
user=>
user=>
user=>
```

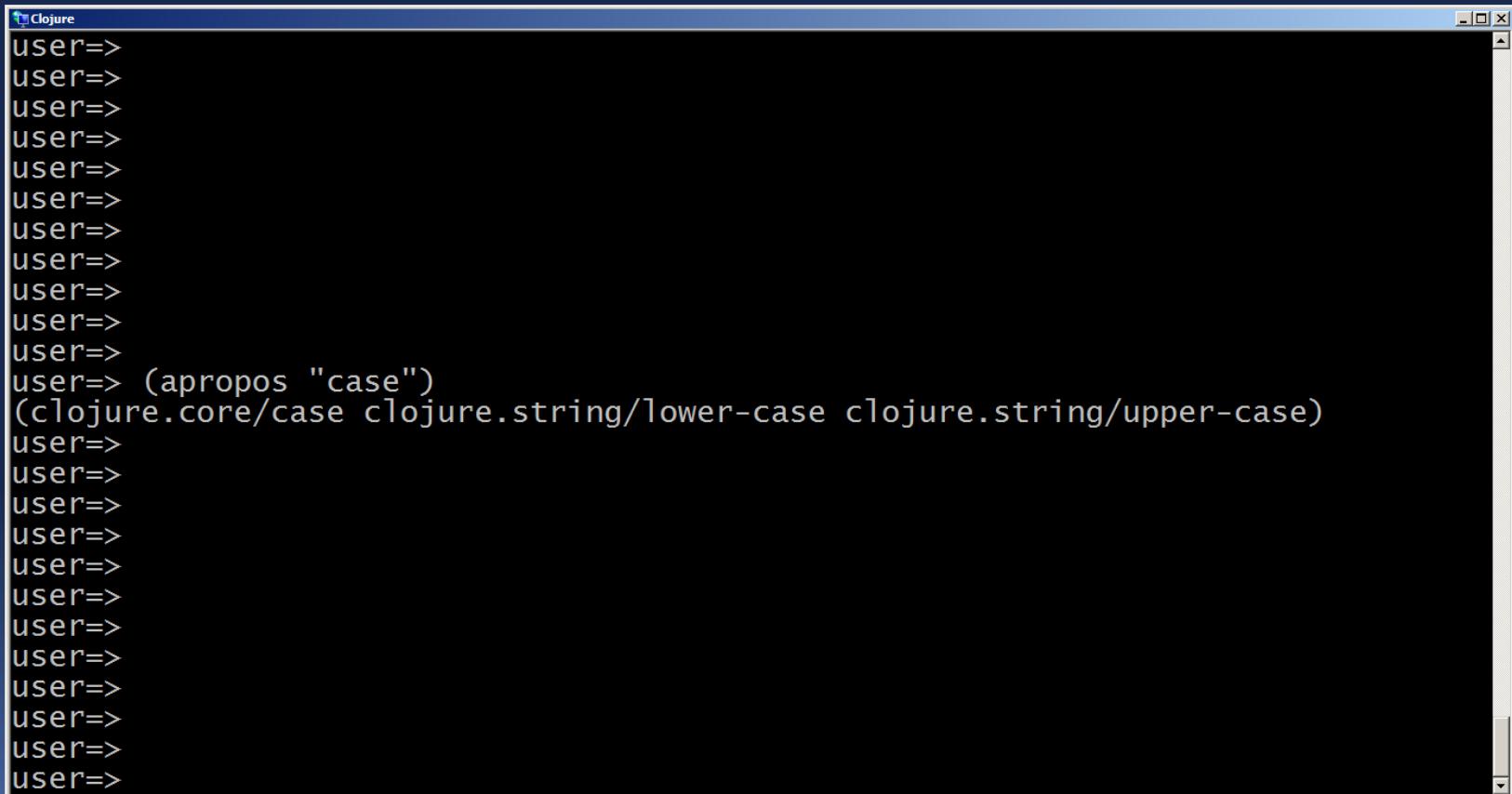
(find-doc)

- ✓ Quando **não** se sabe o nome da função, mas se tem uma ideia de sua descrição ou nome que pode conter, pode-se usar a função **func-doc**;

```
Clojure
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=> (find-doc "float")
-----
clojure.pprint/float-parts
([f])
  Take care of leading and trailing zeros in decomposed floats
-----
clojure.pprint/float-parts-base
([f])
  Produce string parts for the mantissa (normalized 1-9) and exponent
-----
clojure.core/aset-float
([array idx val] [array idx idx2 & idxv])
  Sets the value at the index/indices. Works on arrays of float. Returns val.
-----
clojure.core/float
([x])
  Coerce to float
```

Função apropos

- ✓ Usada para pesquisar funções pelo **nome**, resultando assim uma saída mais sucinta. Por exemplo, pesquisar uma função que transforma um dado string em caracteres maiúsculos ou minúsculos;
- ✓ Observamos na saída que **lower-case** e **upper-case** estão definidas no namespace **clojure.string**.

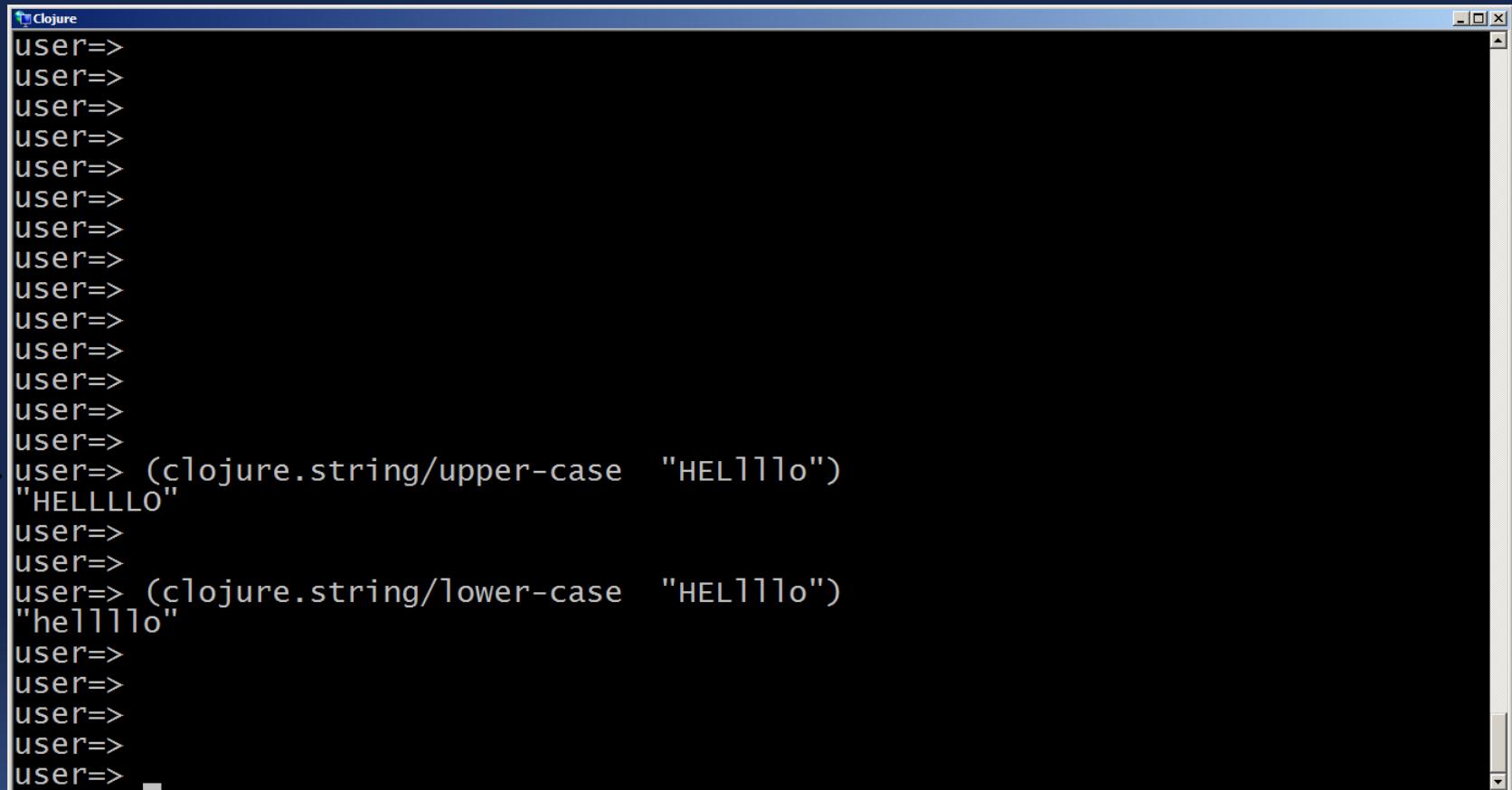


The screenshot shows a terminal window titled "Clojure" with a light blue background. On the left side, there is a large light blue arrow pointing to the right. The terminal displays the following Clojure code and its execution:

```
user=>
user=> (apropos "case")
(clojure.core/case clojure.string/lower-case clojure.string/upper-case)
user=>
```

lower-case e upper-case

- ✓ Observamos na saída que **lower-case** e **upper-case** estão definidas no namespace **clojure.string**.



```
Clojure
user=>
user=> (clojure.string/upper-case "HELLllo")
"HELLLLO"
user=>
user=>
user=> (clojure.string/lower-case "HELllo")
"hellllo"
user=>
user=>
user=>
user=>
user=>
```

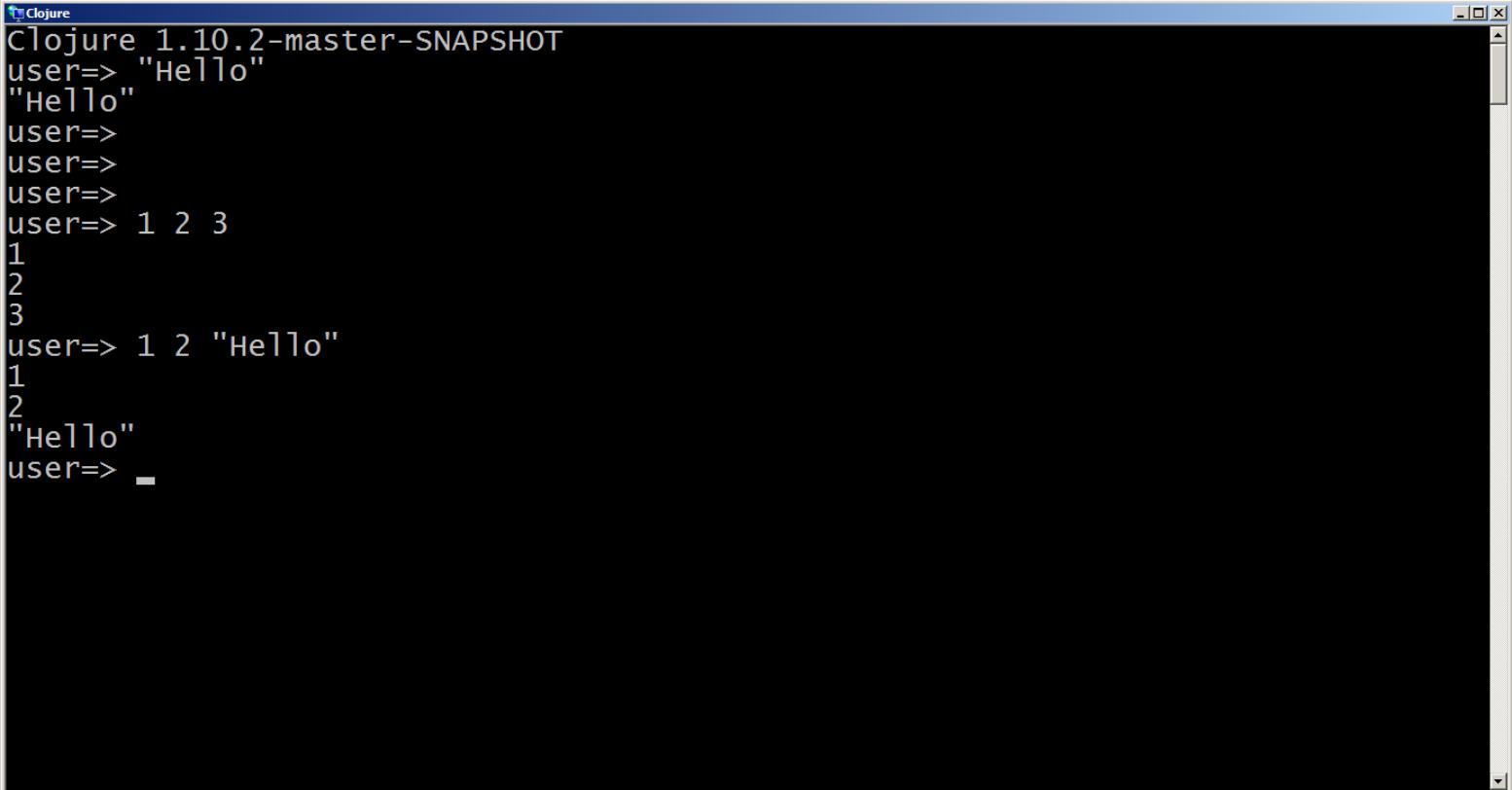
The screenshot shows a Clojure REPL window with a black background and white text. It displays several user inputs starting with 'user=>' followed by function calls to 'upper-case' and 'lower-case' from the 'clojure.string' namespace. Two light blue arrows point to the second and third lines of code, highlighting the function calls.

Atividade 1

- ✓ Abra o **REPL**;
- ✓ Imprima a mensagem: “**Eu não tenho medo de parênteses**”
- ✓ Some 1, 2 e 3 e multiplique o resultado por 10 menos 3;
- ✓ Imprima a mensagem “Atividade Concluída...”;
- ✓ Encerre o **REPL**.

Avaliação de código em Clojure

- ✓ Em Clojure, literais são expressões válidas e ao serem avaliadas retornam os próprios literais.



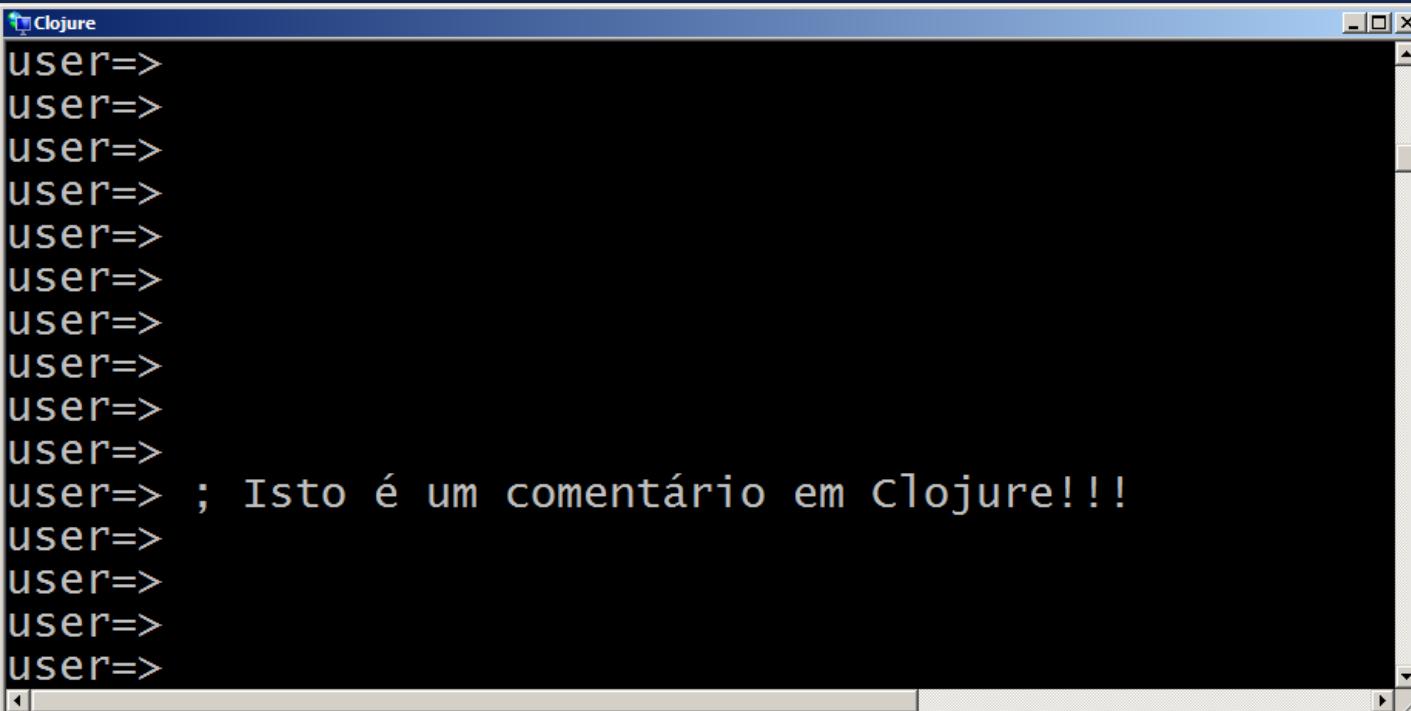
The screenshot shows a terminal window titled "Clojure" with the version "Clojure 1.10.2-master-SNAPSHOT". The window displays the following Clojure code and its evaluated results:

```
Clojure 1.10.2-master-SNAPSHOT
user=> "Hello"
"Hello"
user=>
user=>
user=>
user=> 1 2 3
1
2
3
user=> 1 2 "Hello"
1
2
"Hello"
user=> _
```

Three blue arrows point from the left towards the first three lines of the code in the terminal window, highlighting the evaluation of literals.

Comentários em Clojure

- ✓ Qualquer linha iniciada com ;



A screenshot of a Windows-style application window titled "Clojure". The window contains a black text area with white text. It shows multiple lines of Clojure code starting with "user=>". At the bottom, there is a single line of text: "user=> ; Isto é um comentário em Clojure!!!". The window has standard window controls (minimize, maximize, close) at the top right and scroll bars on the right and bottom.

```
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=> ; Isto é um comentário em Clojure!!!
user=>
user=>
user=>
user=>
```

Funções em Clojure

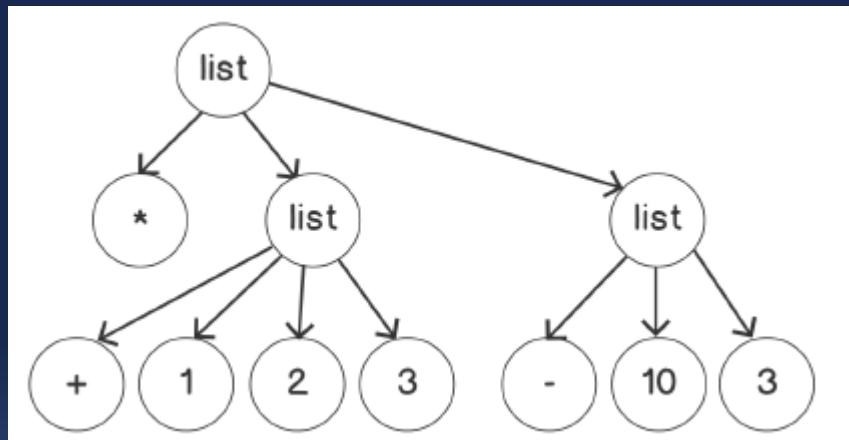
- ✓ São invocadas com a seguinte estrutura:

```
; (operator operand-1 operand-2 operand-3 ...)
; for example:
user=> (* 2 3 4)
24
```

Expressões Simbólicas (s-expression)

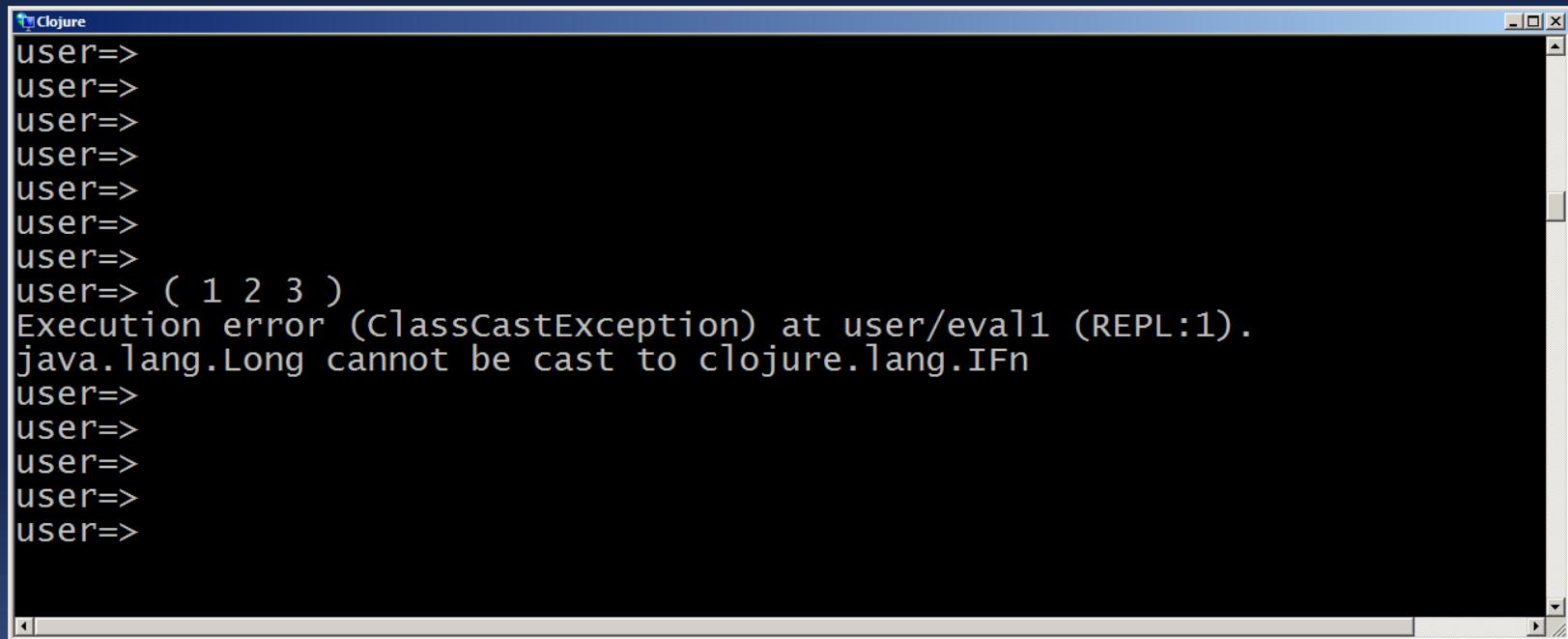
- ✓ Podem ser visualizadas em uma árvore

```
(* (+ 1 2 3) (- 10 3))
```



Listas

- ✓ São usadas para representar funções;
- ✓ Ao usarmos listas para representar **dados**, Clojure retorna erro:

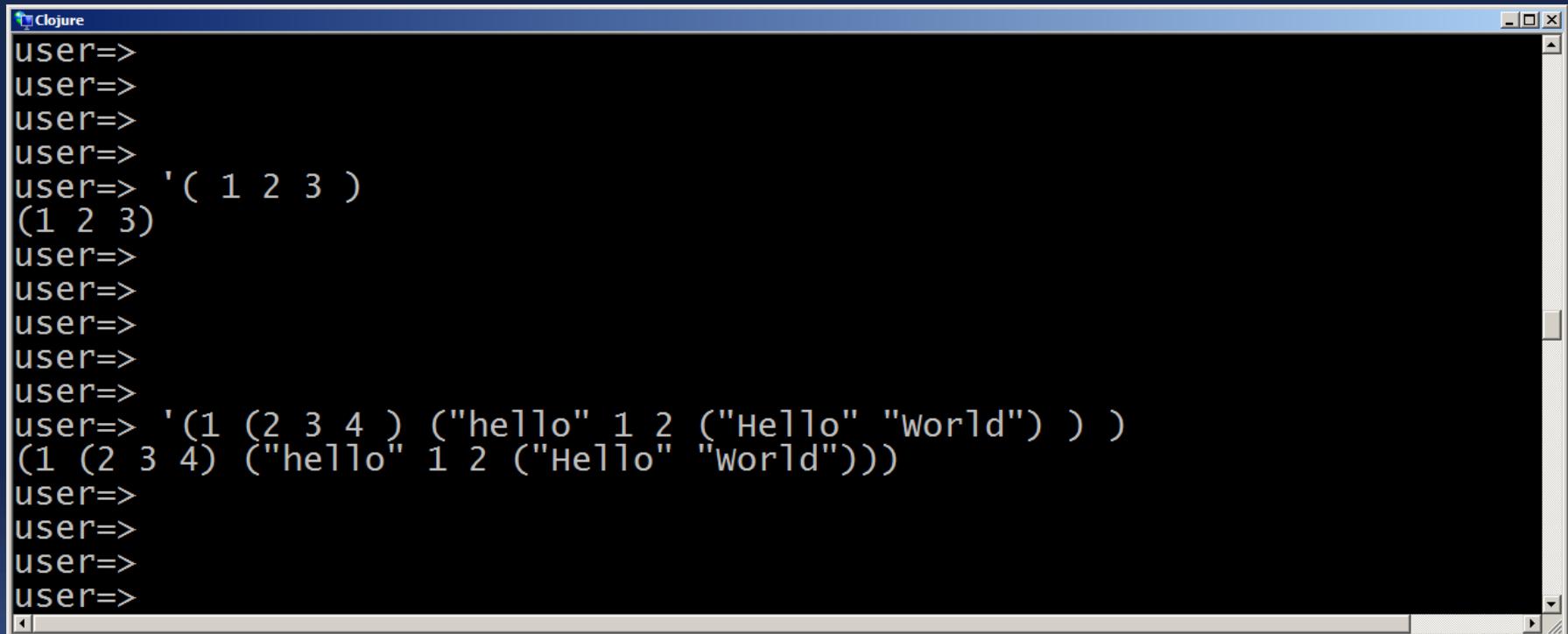


The screenshot shows a terminal window titled "Clojure". The user has entered a list of integers: "(1 2 3)". The system responds with an error message: "Execution error (ClassCastException) at user/eval1 (REPL:1). java.lang.Long cannot be cast to clojure.lang.IFn". This error occurs because Clojure expects the elements of a list to be of type IFn (functions), but it received Long objects from Java's println function.

```
Clojure
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=> ( 1 2 3 )
Execution error (ClassCastException) at user/eval1 (REPL:1).
java.lang.Long cannot be cast to clojure.lang.IFn
user=>
user=>
user=>
user=>
user=>
```

Listas como dados

- ✓ Para que listas não sejam interpretadas como funções, mas simplesmente como dados, devemos circundá-las por apóstrofe ('');



```
Clojure
user=>
user=>
user=>
user=>
user=>
user=> '( 1 2 3 )
(1 2 3)
user=>
user=>
user=>
user=>
user=>
user=> '(1 (2 3 4) ("he11o" 1 2 ("Hello" "World") ) )
(1 (2 3 4) ("he11o" 1 2 ("Hello" "World")))
user=>
user=>
user=>
user=>
```

Código Clojure

- ✓ Código **Clojure** é constituído por estruturas de dados;
- ✓ Nossos programas podem gerar essas estruturas de dados;
- ✓ Assim, num jargão **Lisp**, programas em tempo de execução podem gerar código;
- ✓ Esse conceito é conhecido **por Meta-Programação**.



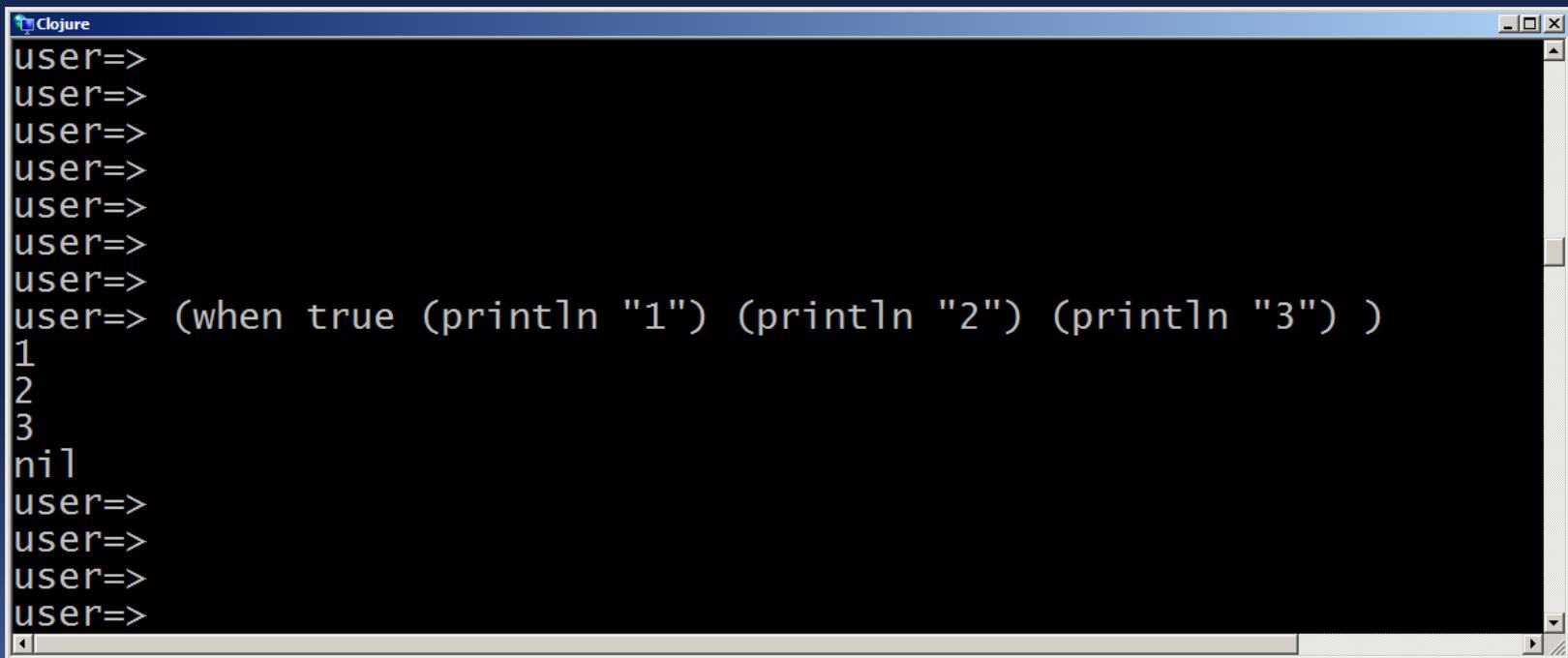
Special Forms

- ✓ Vimos até agora códigos nos quais **Clojure** emprega regras simples de avaliação incorporadas em listas;
- ✓ **Mas**, existem alguns comportamentos que **não** são tratados como nas avaliações usuais;
- ✓ Por exemplo, argumentos passados para uma função **sempre** são avaliados, mas e se **não** quizermos que todos os argumentos sejam avaliados ?
- ✓ Essas regras especiais de avaliação ocorrem nos “**Special Forms**”.
- ✓ Por exemplo, a “**special form**” **if** pode **não** avaliar um de seus argumentos, dependendo do resultado da avaliação do primeiro argumento;



Macro - **when**

- ✓ Usado quando somente estamos interessados no caso em que a condição lógica for verdadeira;
- ✓ É semelhante a um **fi**, mas não contém ramificação **else** e pode ser tratado como um “**do**” **implícito**.



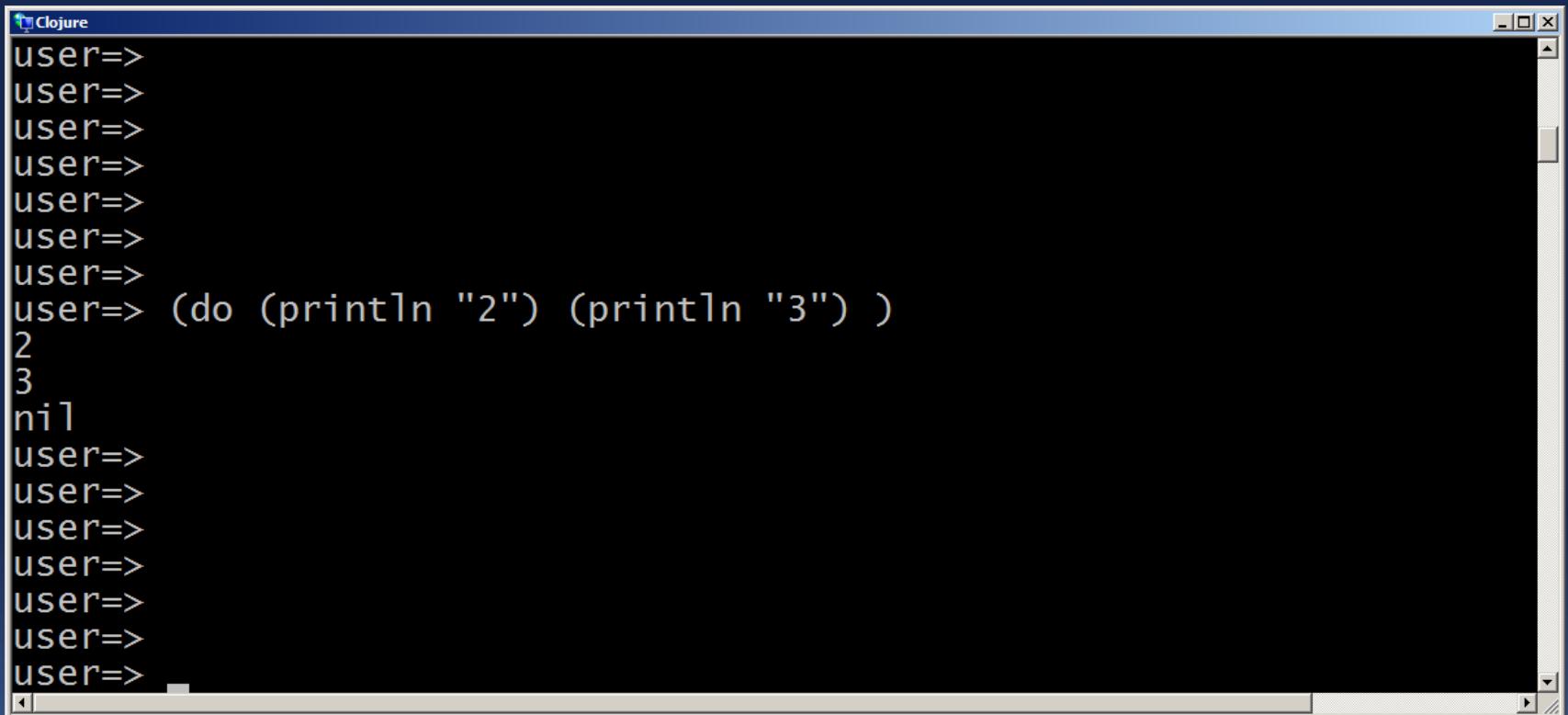
The screenshot shows a Windows-style application window titled "Clojure". Inside the window, the Clojure REPL is running. The user has entered the following code:

```
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=> (when true (println "1") (println "2") (println "3"))
1
2
3
nil
user=>
user=>
user=>
user=>
```

The output shows the numbers 1, 2, and 3 printed sequentially, demonstrating the execution of the code within the when macro's body.

Special Forms - do

- ✓ Usado para executar uma série de expressões e retornar o valor da última expressão.



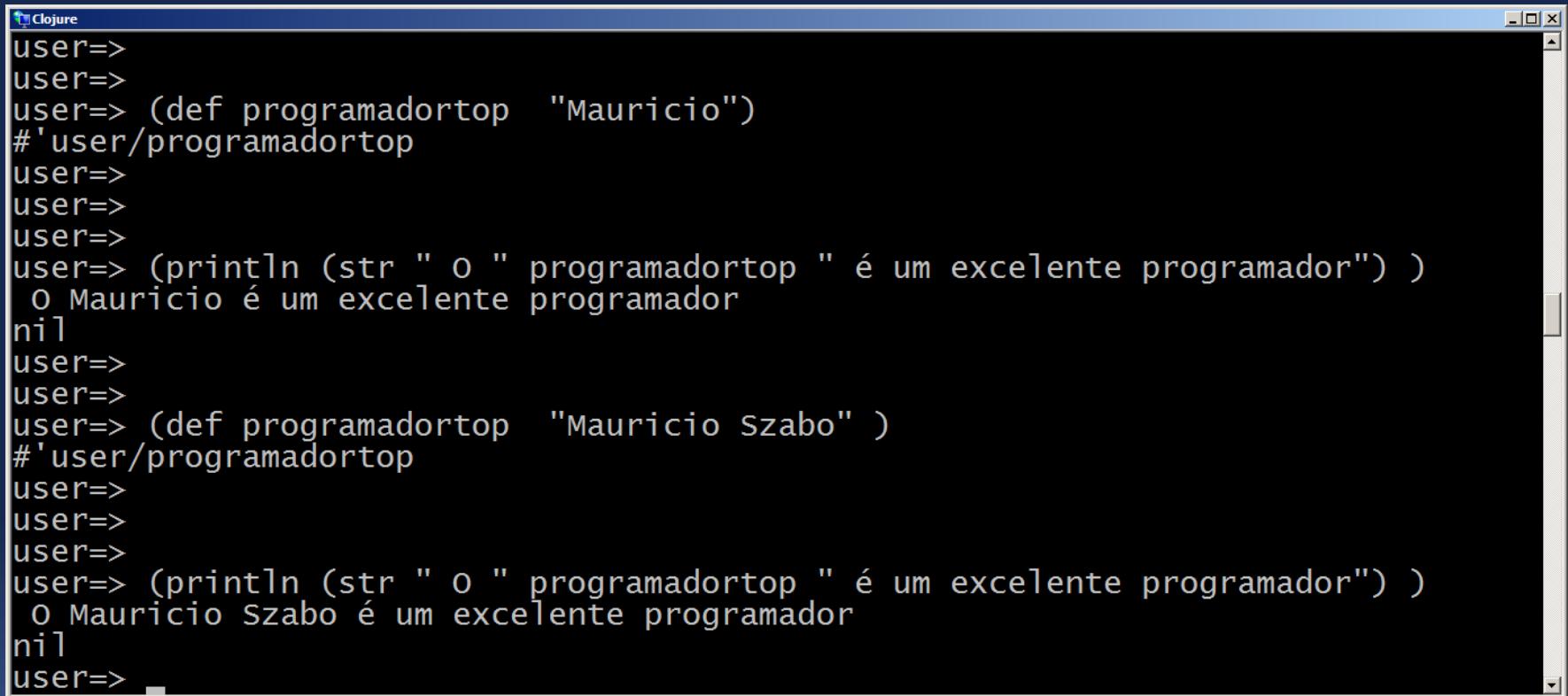
The screenshot shows a Windows-style window titled "Clojure". Inside, the Clojure REPL is running. The user has typed:

```
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=> (do (println "2") (println "3") )
2
3
nil
user=>
user=>
user=>
user=>
user=>
user=>
user=>
```

The output shows the numbers 2 and 3 printed to the console, followed by nil, indicating that the last expression evaluated was nil.

Macro - def

- ✓ Usado para se ligar (**binding**) símbolos a determinados valores;



The screenshot shows a terminal window titled "Clojure" with the following session:

```
Clojure
user=>
user=>
user=> (def programadortop "Mauricio")
#'user/programadortop
user=>
user=>
user=>
user=> (println (str " o " programadortop " é um excelente programador" ) )
O Mauricio é um excelente programador
nil
user=>
user=>
user=> (def programadortop "Mauricio Szabo" )
#'user/programadortop
user=>
user=>
user=>
user=> (println (str " o " programadortop " é um excelente programador" ) )
O Mauricio Szabo é um excelente programador
nil
user=>
```

Macro - let

- ✓ Usado para se ligar (**binding**) símbolos a determinados valores;
- ✓ Opera com um **vetor** o qual associa um **símbolo** especificado no primeiro elemento a um **valor** especificado no segundo elemento;
- ✓ Os símbolos definidos no **let** **não** podem ser usados fora do let. Este comportamento é semelhante à variáveis **private** em outras linguagens.



Macro - let

```
Clojure
user=>
user=> (let [m "Maurício" a "Aparecido"] (println (str m " e " a) ) )
Maurício e Aparecido
nil
user=>
user=> m
Syntax error compiling at (REPL:0:0).
Unable to resolve symbol: m in this context
user=>
user=>
user=> a
Syntax error compiling at (REPL:0:0).
Unable to resolve symbol: a in this context
user=>
```

Macro - fn

- ✓ Funções são **objetos de primeira ordem em Clojure**; Isso significa que em **Clojure** pode-se fazer todas as operações básicas com funções;
- ✓ Ou seja, pode-se passar funções à outras funções, retornar funções de outras funções e ligar (binding) funções à símbolos (variáveis);
- ✓ A macro **fn** é usada para se criar **funções anônimas**;
- ✓ **#()** é o shortcut para **fn**;
- ✓ **%** será substituído pelos argumentos passados para a função. Quando houver múltiplos argumentos, **%1** para o primeiro argumento, **%2** para o segundo argumento e assim por diante.

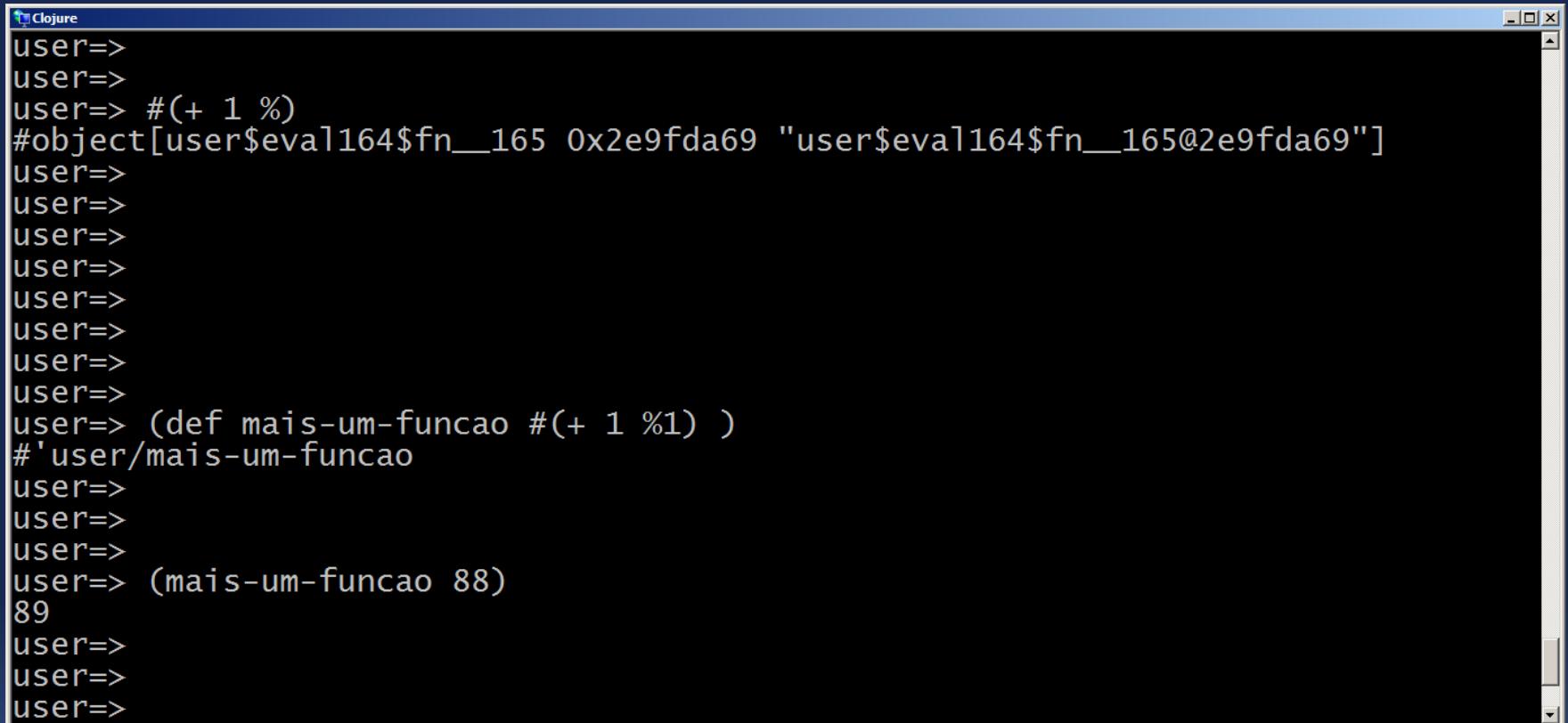
Macro - **fn**

```
Clojure
user=>
user=>
user=>
user=>
user=>
user=> (fn [] (println "Hello World....") )
#object[user$eval140$fn__141 0xaafcffa "user$eval140$fn__141@aafcffa"]
user=>
user=>
user=>
user=>
user=> (def hello-world-function (fn [] (println "Hello World") ) )
#'user/hello-world-function
user=>
user=>
user=>
user=>
user=> (hello-world-function)
Hello World
nil
user=>
user=>
user=>
```

Macro - **fn**

```
Clojure
user=>
user=>
user=>
user=>
user=> #(+ 1 1 )
#object[user$eval155$fn__156 0x64a8c844 "user$eval155$fn__156@64a8c844"]
user=>
user=>
user=>
user=> (def um-mai-um-funcao #(+ 1 1 ) )
#'user/um-mai-um-funcao
user=>
user=>
user=>
user=>
user=> (um-mais-um-funcao)
2
user=>
user=>
user=>
user=>
user=>
```

Macro - fn



The screenshot shows a Windows-style window titled "Clojure". Inside, a Clojure REPL session is running. The user has defined a macro named `mais-um-funcao` which expands to `(+ 1 %1)`. When this macro is used with the argument `88`, it correctly evaluates to `89`.

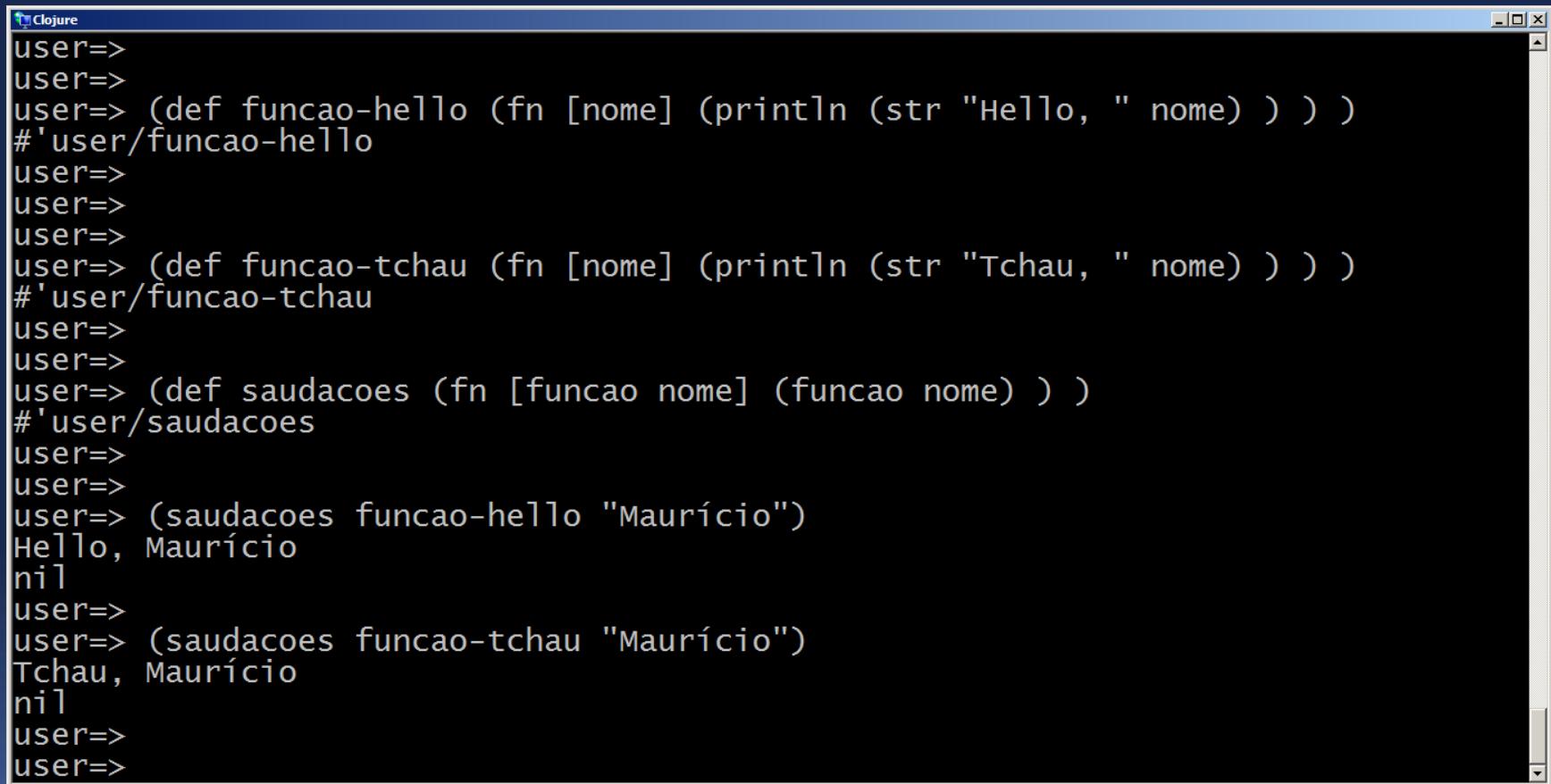
```
Clojure
user=>
user=>
user=> #(+ 1 %)
#object[user$eval164$fn__165 0x2e9fda69 "user$eval164$fn__165@2e9fda69"]
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=> (def mais-um-funcao #(+ 1 %1) )
#'user/mais-um-funcao
user=>
user=>
user=>
user=> (mais-um-funcao 88)
89
user=>
user=>
user=>
```

Macro - fn

```
Clojure
user=>
user=>
user=>
user=>
user=>
user=>
user=> #(+ %1 %2)
#object[user$eval177$fn__178 0x5a411614 "user$eval177$fn__178@5a411614"]
user=>
user=>
user=>
user=>
user=> (def funcao-soma  #(+ %1 %2) )
#'user/funcao-soma
user=>
user=>
user=>
user=> (funcao-soma 2 3)
5
user=>
user=>
user=>
user=>
```

Macro - fn

Passando funções à funções



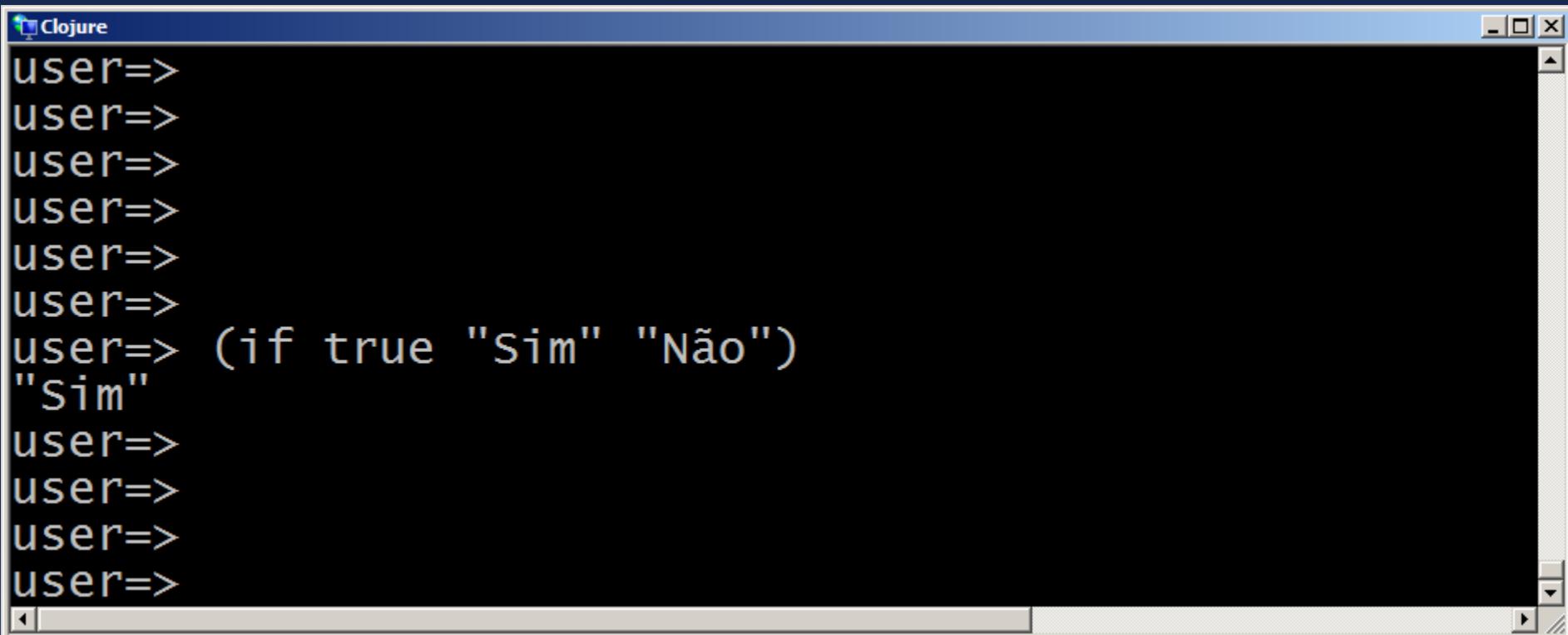
The screenshot shows a Clojure REPL window titled "Clojure". The user has defined three functions: `funcao-hello`, `funcao-tchau`, and `saudacoes`. The `saudacoes` function takes another function as an argument and applies it to a name. The user then calls `saudacoes` with `funcao-hello` and `funcao-tchau`, resulting in the output "Hello, Maurício" and "Tchau, Maurício" respectively.

```
user=>
user=>
user=> (def funcao-hello (fn [nome] (println (str "Hello, " nome) ) ) )
#'user/funcao-hello
user=>
user=>
user=>
user=> (def funcao-tchau (fn [nome] (println (str "Tchau, " nome) ) ) )
#'user/funcao-tchau
user=>
user=>
user=> (def saudacoes (fn [funcao nome] (funcao nome) ) )
#'user/saudacoes
user=>
user=>
user=> (saudacoes funcao-hello "Maurício")
Hello, Maurício
nil
user=>
user=> (saudacoes funcao-tchau "Maurício")
Tchau, Maurício
nil
user=>
user=>
```

Atividade 2

- ✓ Abra o **REPL**;
- ✓ Escreva a função `if` que retorna "Sim" se a condição for verdadeira e "Não" caso contrário.
- ✓ Encerre o **REPL**.

Atividade 2



The screenshot shows a terminal window titled "Clojure" with a blue header bar. The window contains the following text:

```
user=>
user=>
user=>
user=>
user=>
user=>
user=> (if true "Sim" "Não")
"Sim"
user=>
user=>
user=>
user=>
```

The terminal window has standard operating system window controls (minimize, maximize, close) at the top right and scroll bars on the right side.

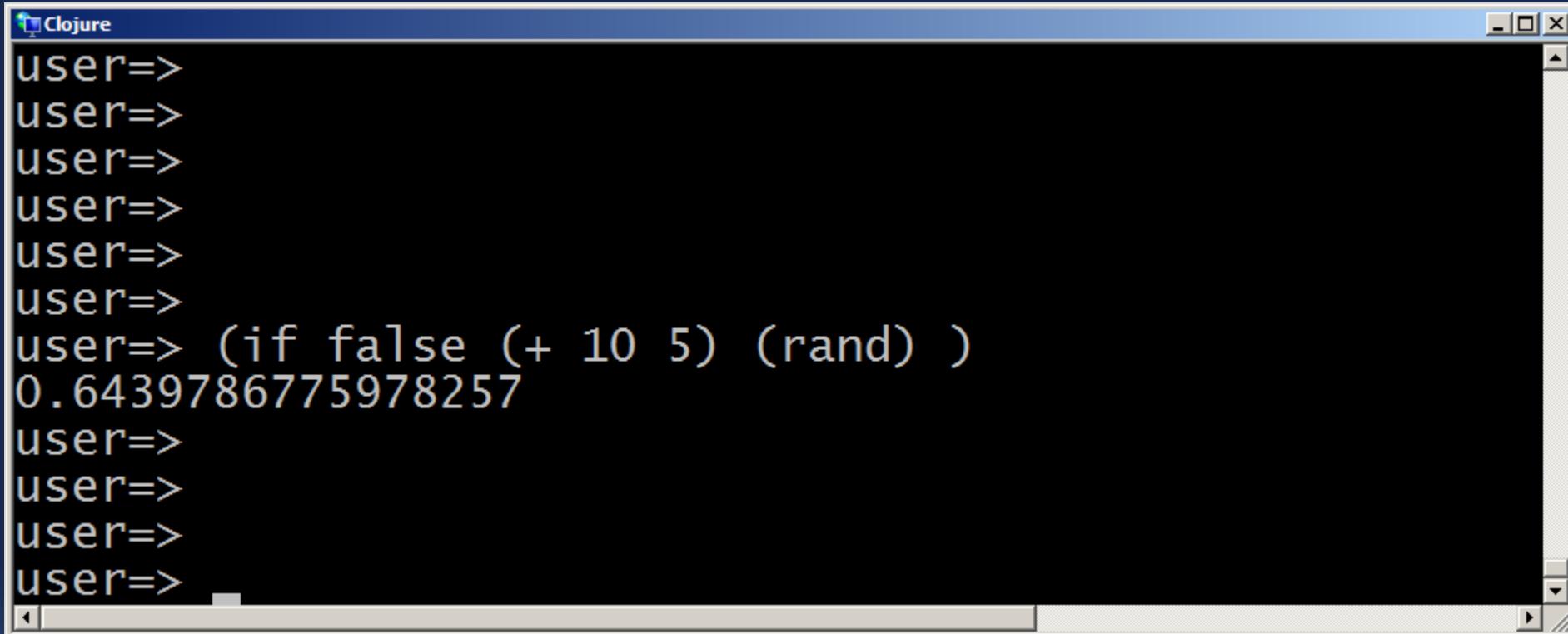
Atividade 3

- ✓ Abra o **REPL**;
- ✓ Escreva a função `if` que retorna a soma de 10 com 5 se a condição for falsa. Caso contrário retorna um número randômico.
- ✓ Encerre o **REPL**.

Dica. A função `rand` retorna um número `rand`.



Atividade 3



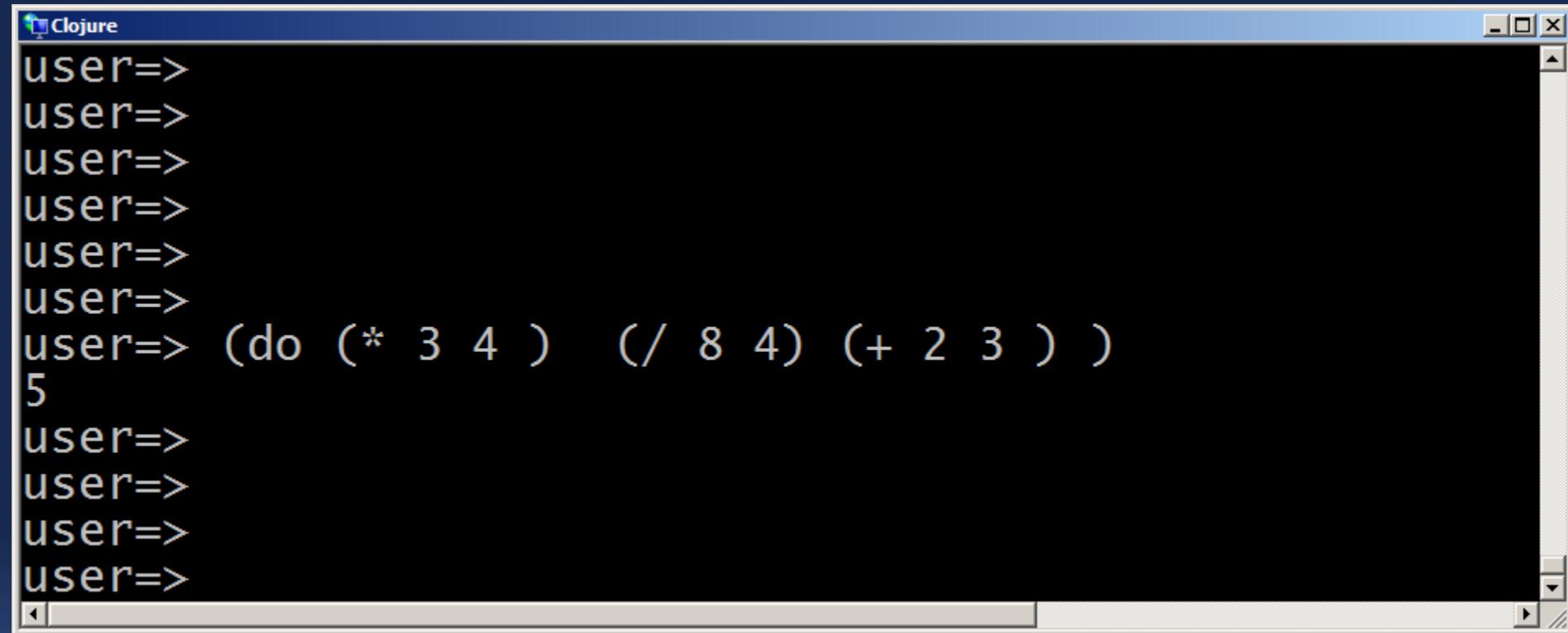
The screenshot shows a terminal window titled "Clojure". It displays a series of user inputs starting with "user=>" followed by a single output line: "0.6439786775978257". This indicates a functional programming environment where the user has entered a conditional expression and received a numerical result.

```
Clojure
user=>
user=>
user=>
user=>
user=>
user=>
user=> (if false (+ 10 5) (rand) )
0.6439786775978257
user=>
user=>
user=>
user=>
```

Atividade 4

- ✓ Abra o **REPL**;
- ✓ Escreva a função “**do**” que executa sequencialmente as seguintes avaliações:
 - ✓ Multiplica 3 por 4;
 - ✓ Divide 8 por 4;
 - ✓ Soma 2 com 3.
- ✓ Encerre o **REPL**.

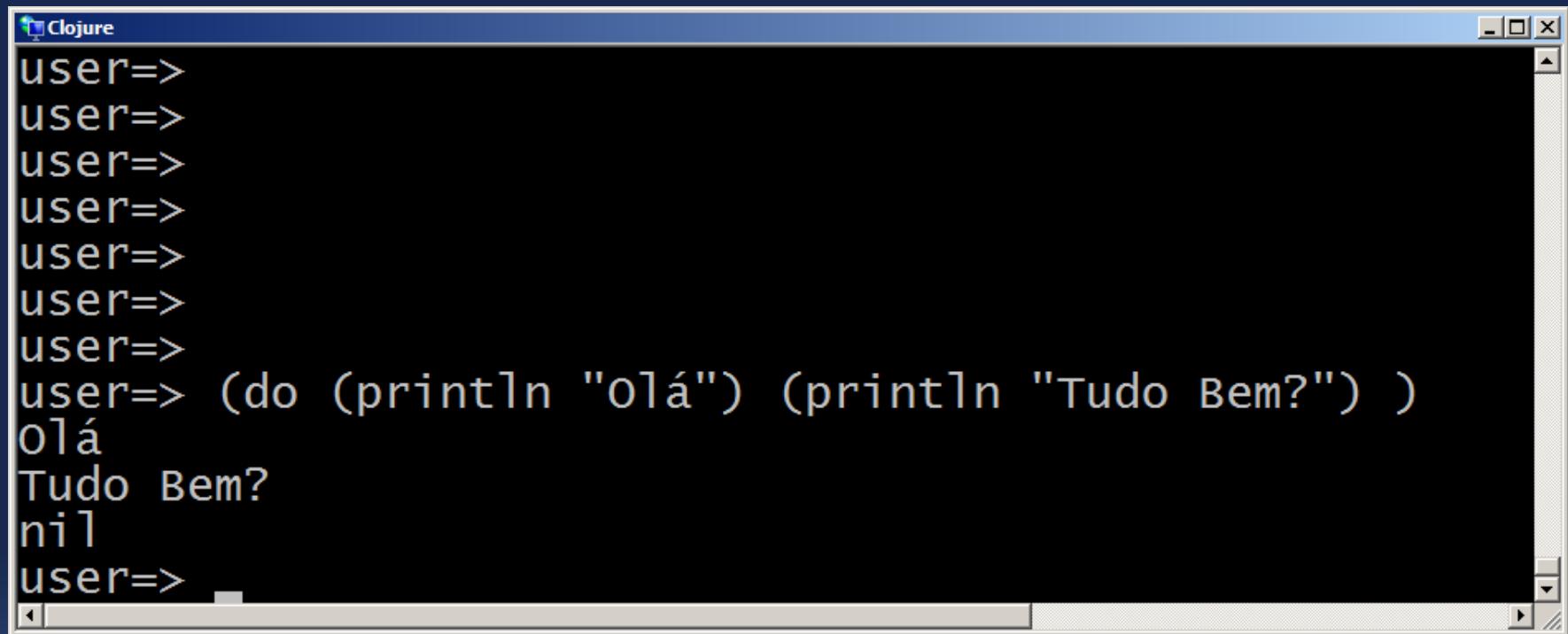
Atividade 4



The screenshot shows a terminal window titled "Clojure" with a blue header bar. The window contains the following text:

```
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=> (do (* 3 4) (/ 8 4) (+ 2 3) )
5
user=>
user=>
user=>
user=>
```

Observação – Side Effect



The screenshot shows a Windows-style application window titled "Clojure". Inside, a Clojure REPL session is running. The user has entered several forms, mostly consisting of the symbol "user=>". One form contains a "do" block with two "println" statements. The output shows the strings "olá" and "Tudo Bem?" printed to the console, demonstrating the side effect of the "do" block.

```
Clojure
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=> (do (println "olá") (println "Tudo Bem?") )
olá
Tudo Bem?
nil
user=>
```

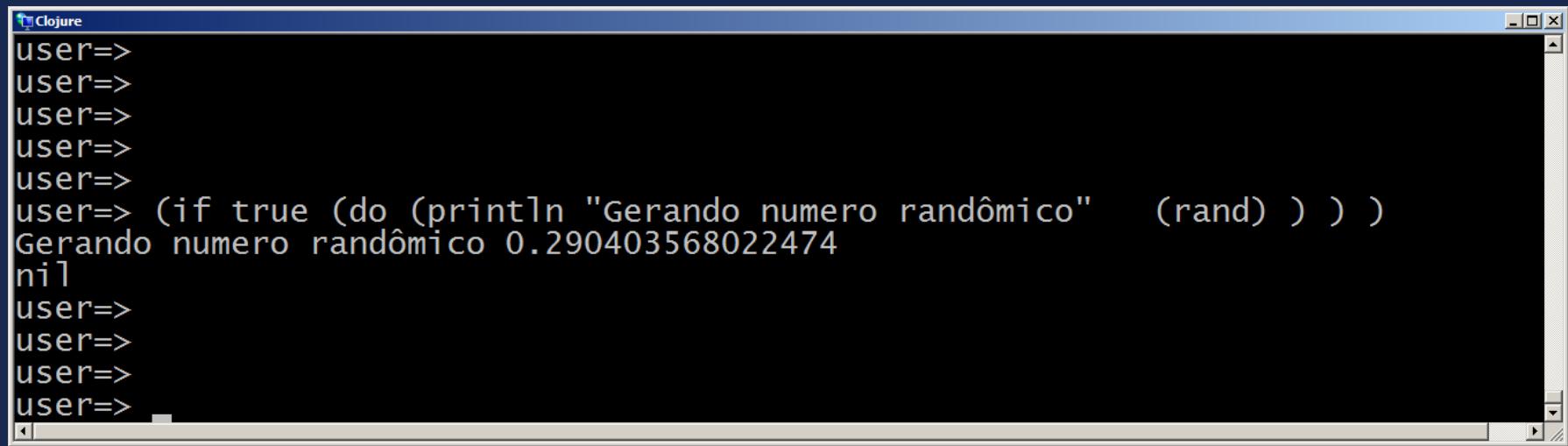
Atividade 5

- ✓ Abra o **REPL**;

- ✓ Escreva a função “**if**” que imprime a mensagem “Gerando um número randômico” e exibe o número gerado, caso a condição seja verdadeira;

- ✓ Encerre o **REPL**.

Atividade 5



A screenshot of a Clojure REPL window titled "Clojure". The window shows the following interaction:

```
Clojure
user=>
user=>
user=>
user=>
user=>
user=> (if true (do (println "Gerando numero randômico"      (rand) ) ) )
Gerando numero randômico 0.290403568022474
nil
user=>
user=>
user=>
user=>
```

Atividade 6

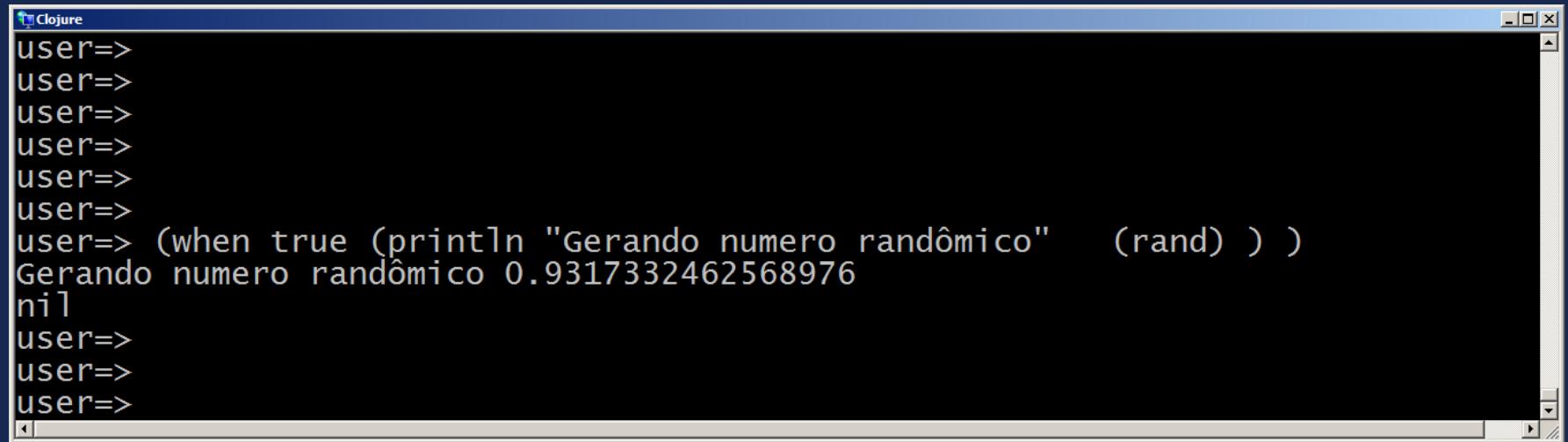
- ✓ Abra o **REPL**;

- ✓ Escreva a função “**when**” que imprime a mensagem “Gerando um número randômico” e exibe o número gerado, caso a condição seja verdadeira;

- ✓ Encerre o **REPL**.



Atividade 6



A screenshot of a Windows-style application window titled "Clojure". The window contains a black terminal-like interface with white text. The text shows a sequence of user inputs starting with "user=>" followed by a call to the "rand" function. The output is a generated random double value: "0.9317332462568976". The window has standard window controls (minimize, maximize, close) at the top right and scroll bars on the right side.

```
user=>
user=>
user=>
user=>
user=>
user=>
user=> (when true (println "Gerando numero randômico" (rand) ) )
Gerando numero randômico 0.9317332462568976
nil
user=>
user=>
user=>
```

Bindings

- ✓ Em **Clojure**, **Binding** significa **ligação** de símbolos à valores;
- ✓ O termo **Binding** é preferível ao invés de atribuição, pois essas ligações quase sempre são feitas uma única vez;
- ✓ Diferentemente de atribuição em variáveis que, na grande maioria das linguagens, ocorrem com frequência justificando assim o uso no nome de variáveis;
- ✓ Em **Clojure**, o nome **símbolo** é preferível ao nome **variável**;
- ✓ Bindings podem ser feitos em **Clojure** de forma local (função let) ou de forma global (função def).

Atividade 7

- ✓ Abra o **REPL**;

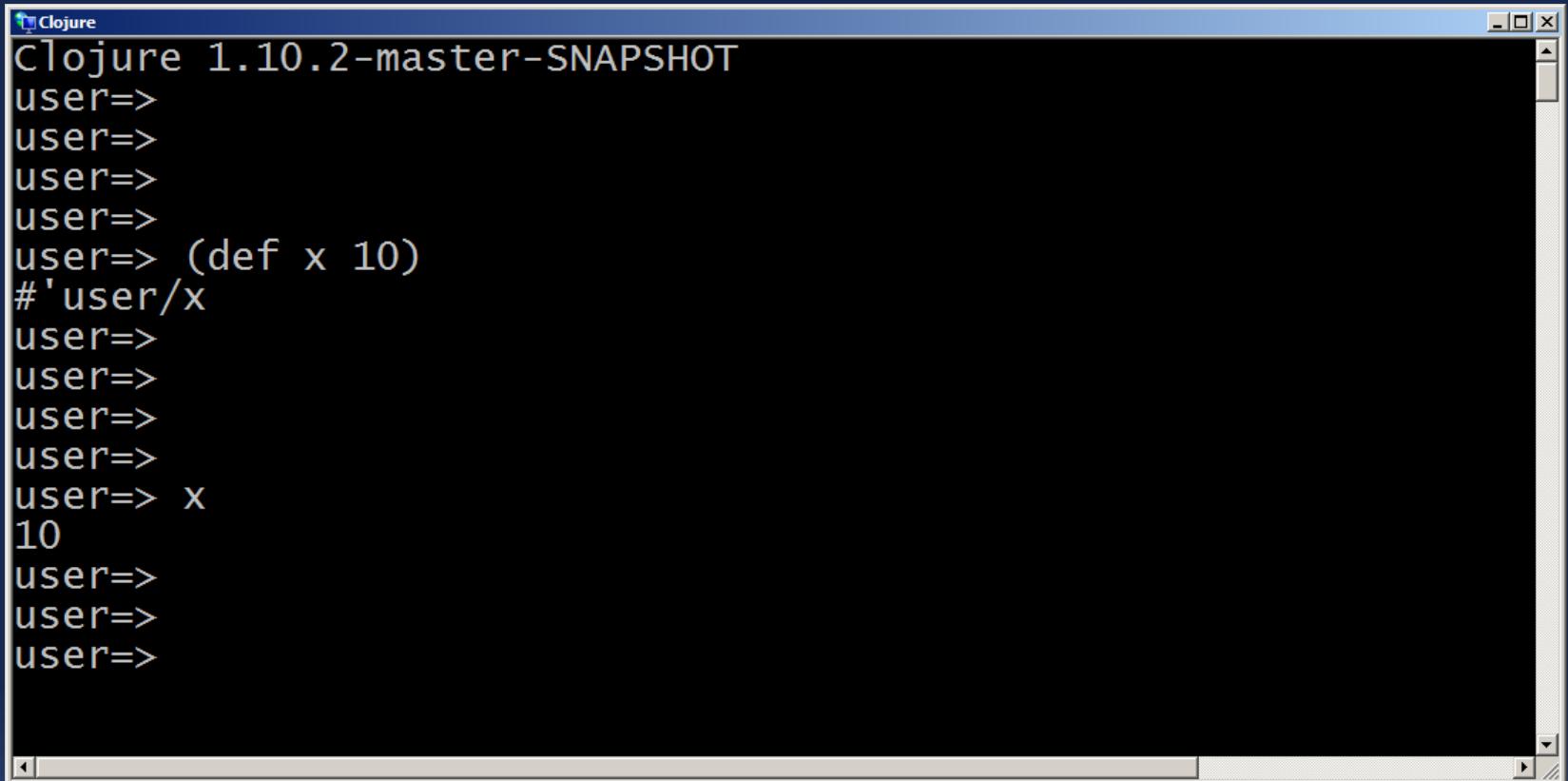
- ✓ Com o emprego da *special form def*, escreva o código que efetua a ligação do símbolo *x* ao valor 10;

- ✓ Em seguida, avalie o valor do símbolo *x*;

- ✓ Encerre o **REPL**.



Atividade 7



The screenshot shows a terminal window titled "Clojure" running on "Clojure 1.10.2-master-SNAPSHOT". The session starts with several blank "user=>" prompts. Then, the user enters "(def x 10)". The REPL returns "#'user/x", indicating a reference to the symbol "x" defined in the "user" namespace. Subsequent "user=>" prompts show the value of "x" being printed as "10".

```
Clojure 1.10.2-master-SNAPSHOT
user=>
user=>
user=>
user=>
user=> (def x 10)
#'user/x
user=>
user=>
user=>
user=>
user=> x
10
user=>
user=>
user=>
```

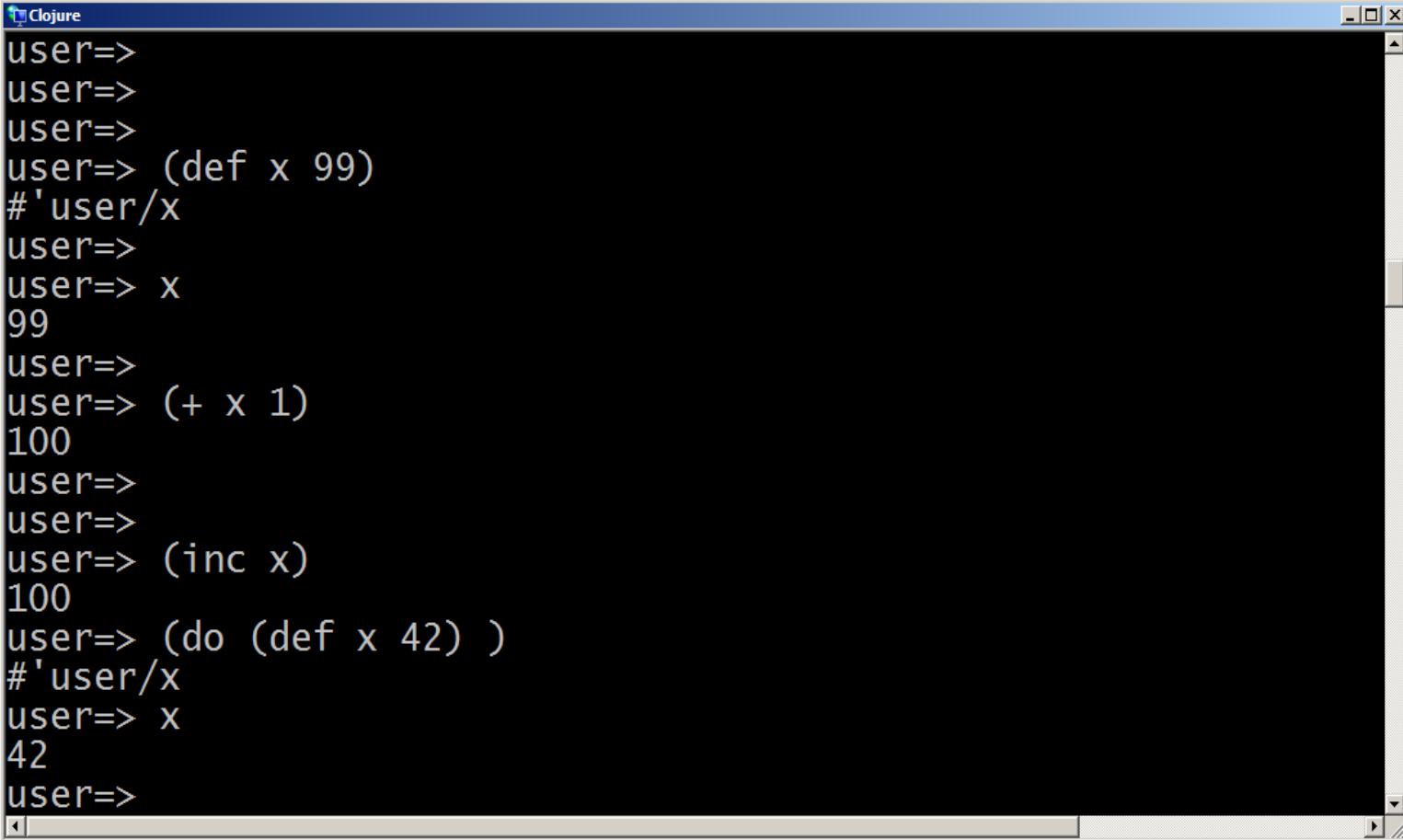
- ✓ Observação: Quando **REPL** retorna **'#user/x**, ele está retornando uma referência ao símbolo **x** (variável) criado. A parte **user** indica o **namespace** onde o símbolo **x** foi definido

Binding

- ✓ É possível redefinir um símbolo criado previamente ?
- ✓ Sim, é possível modificar-se o binding por meio de: **(def x 20)**
- ✓ **Mas, não** se recomenda redefinir-se símbolos em nossos programas uma vez que tal procedimento dificulta a leitura e a manutenção do código;
- ✓ Assim, em **Clojure** uma boa prática é considerar a operação de binding como constante.

Binding

- ✓ Uma vez definido um símbolo por meio de binding, pode-se utilizá-lo em avaliação de expressões e redefiní-lo ainda por binding;



```
Clojure
user=>
user=>
user=>
user=> (def x 99)
#'user/x
user=>
user=> x
99
user=>
user=> (+ x 1)
100
user=>
user=>
user=> (inc x)
100
user=> (do (def x 42) )
#'user/x
user=> x
42
user=>
```

Binding e Escopo

- ✓ Bindings criados pela special form **def** têm **escopo dinâmico** e podem ser considerados como “**globais**”. Eles são, dessa forma, automaticamente namespaced, o qual é útil para evitar conflitos com nomes existentes;
- ✓ Para se definir bindings com escopo **local** (ou escopo **léxico**), deve-se usar a special form **let**.

y está fora
do escopo
definido
em let !!!

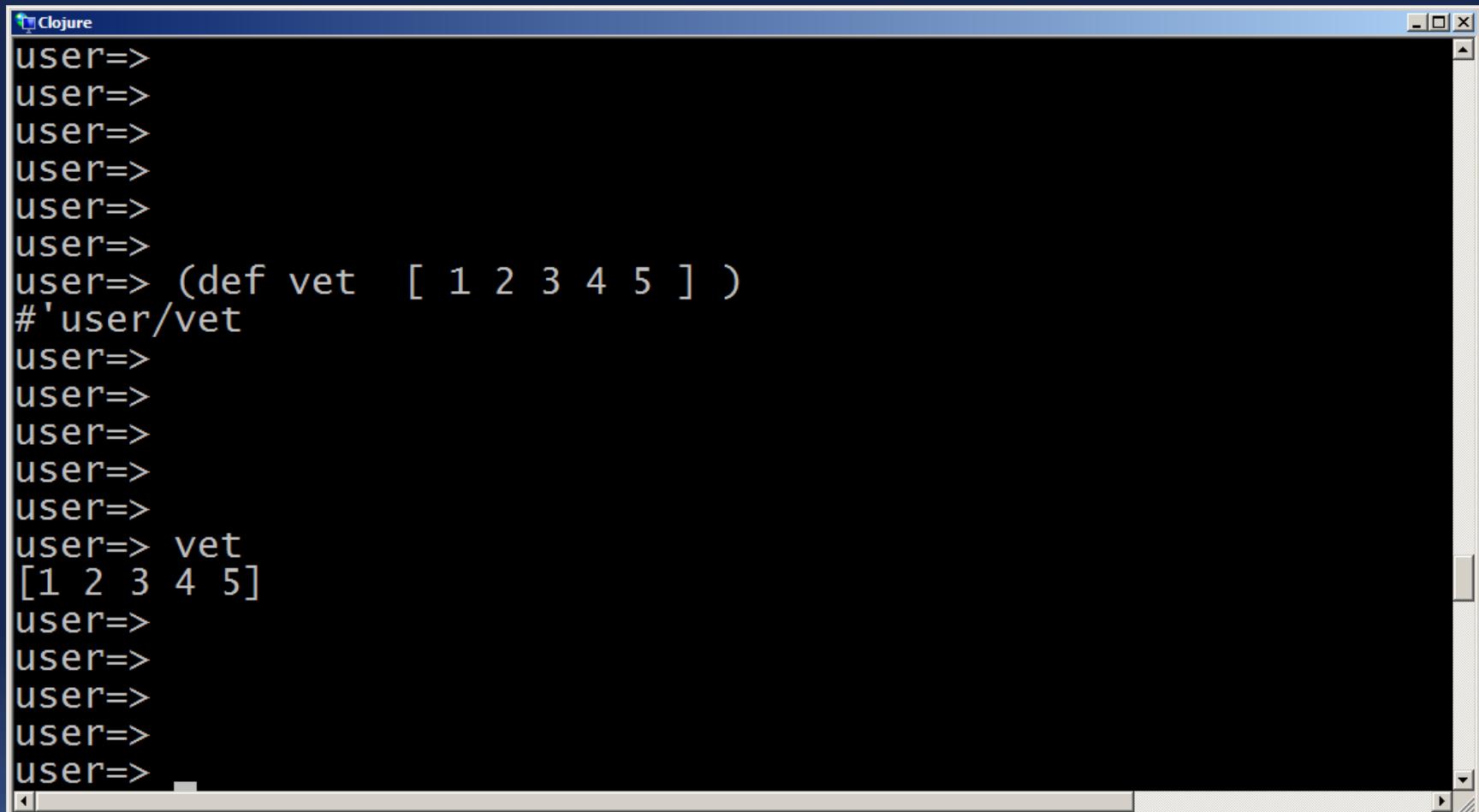


```
Clojure
user=>
user=>
user=>
user=>
user=>
user=> (let [y 3] (println y) (* 10 y) )
3
30
user=>
user=>
user=>
user=>
user=>
user=> y
Syntax error compiling at (REPL:0:0).
Unable to resolve symbol: y in this context
user=>
user=>
user=>
user=>
```

Observação let

- ✓ A special form **let** emprega um vetor como um parâmetro para criar bindings locais e uma série de expressões que serão avaliadas como se estivessem em um bloco;
- ✓ Um **vetor** é similar a uma **lista**, no sentido em que ambos correspondem a uma coleção sequencial de valores;
- ✓ Na próxima unidade veremos com mais detalhes os vetores;
- ✓ Por ora, apenas é importante saber que **vetores** podem ser criados por **colchetes**;
- ✓ Por exemplo: [1 2 3 4 5]

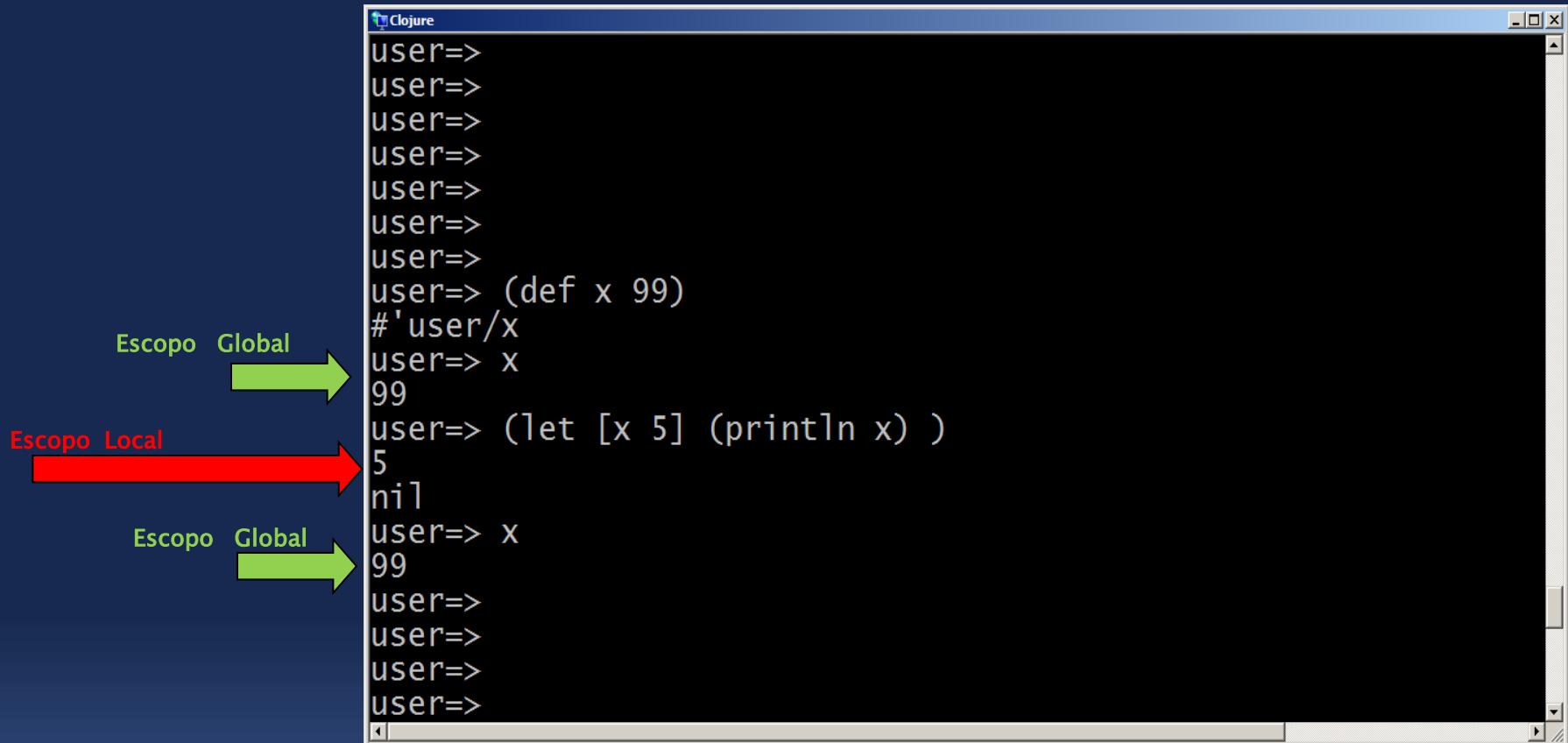
Definindo vetores



The screenshot shows a Clojure REPL window with the title 'Clojure'. The user has defined a vector named 'vet' containing the integers 1 through 5. When the user then types 'vet', the REPL returns the vector [1 2 3 4 5].

```
Clojure
user=>
user=>
user=>
user=>
user=>
user=>
user=> (def vet  [ 1 2 3 4 5 ] )
#'user/vet
user=>
user=>
user=>
user=>
user=>
user=>
user=> vet
[1 2 3 4 5]
user=>
user=>
user=>
user=>
user=>
```

Escopos Global e Local



```
Clojure
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=> (def x 99)
#'user/x
user=> x
99
user=> (let [x 5] (println x) )
5
nil
user=> x
99
user=>
user=>
user=>
user=>
```

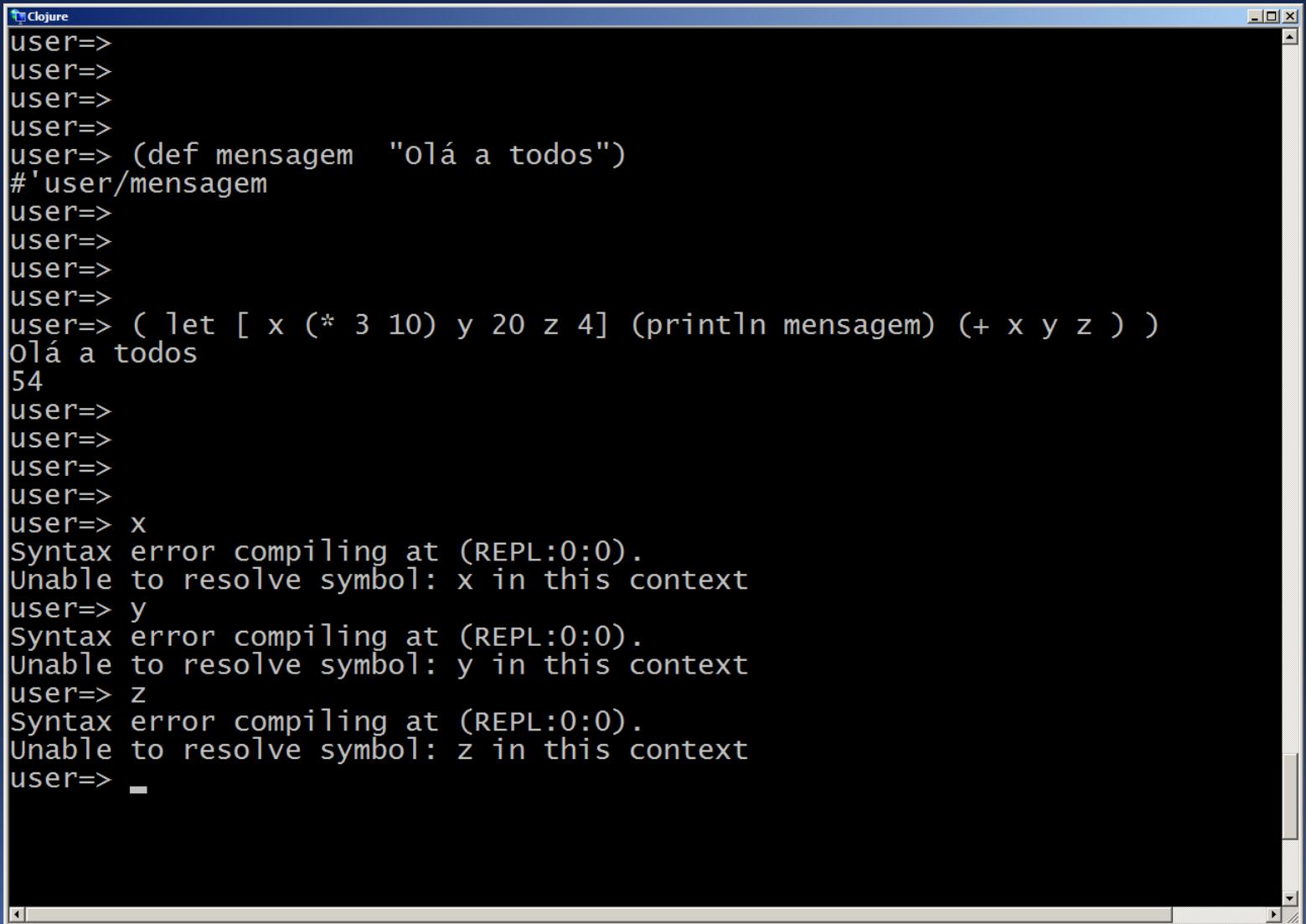
Macro let – Escopo local

Escopo Local



```
Clojure
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=> (let [x 10 y 99]  (str "x=" x " y=" y) )
"x=10 y=99"
user=>
user=>
user=>
user=>
user=> x
Syntax error compiling at (REPL:0:0).
Unable to resolve symbol: x in this context
user=>
user=>
user=>
user=> y
Syntax error compiling at (REPL:0:0).
Unable to resolve symbol: y in this context
user=>
user=>
```

Macro let – Escopo local



The screenshot shows a terminal window titled "Clojure" with the following session:

```
Clojure
user=>
user=>
user=>
user=>
user=> (def mensagem "olá a todos")
#'user/mensagem
user=>
user=>
user=>
user=>
user=> ( let [ x (* 3 10) y 20 z 4] (println mensagem) (+ x y z) )
olá a todos
54
user=>
user=>
user=>
user=>
user=> x
Syntax error compiling at (REPL:0:0).
Unable to resolve symbol: x in this context
user=> y
Syntax error compiling at (REPL:0:0).
Unable to resolve symbol: y in this context
user=> z
Syntax error compiling at (REPL:0:0).
Unable to resolve symbol: z in this context
user=> -
```



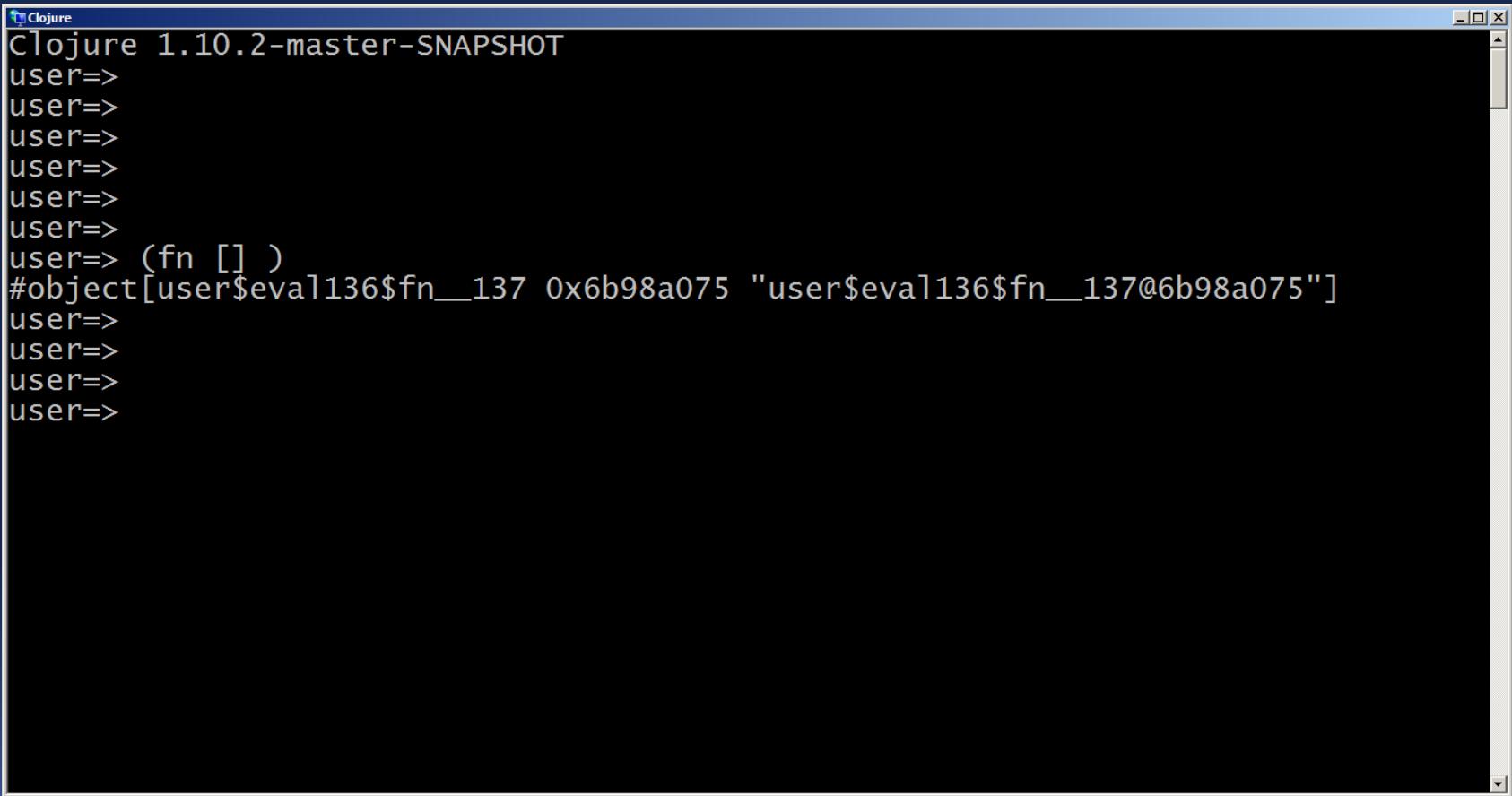
Atividade 8

- ✓ Abra o **REPL**;
- ✓ Com a macro **fn** defina uma função que **não** recebe argumentos e que também **nada** faz;
- ✓ Encerre o **REPL**.



Atividade 8

(fn [])



The screenshot shows a terminal window titled "Clojure" running on "Clojure 1.10.2-master-SNAPSHOT". The user has entered several "user=>" prompts, followed by the creation of an anonymous function using the syntax "(fn [])". The resulting object is displayed as "#object[user\$eval136\$fn__137 0x6b98a075 "user\$eval136\$fn__137@6b98a075"]". The window has a standard Windows-style title bar and scroll bars.

```
Clojure 1.10.2-master-SNAPSHOT
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=> (fn [] )
#object[user$eval136$fn__137 0x6b98a075 "user$eval136$fn__137@6b98a075"]
user=>
user=>
user=>
user=>
```

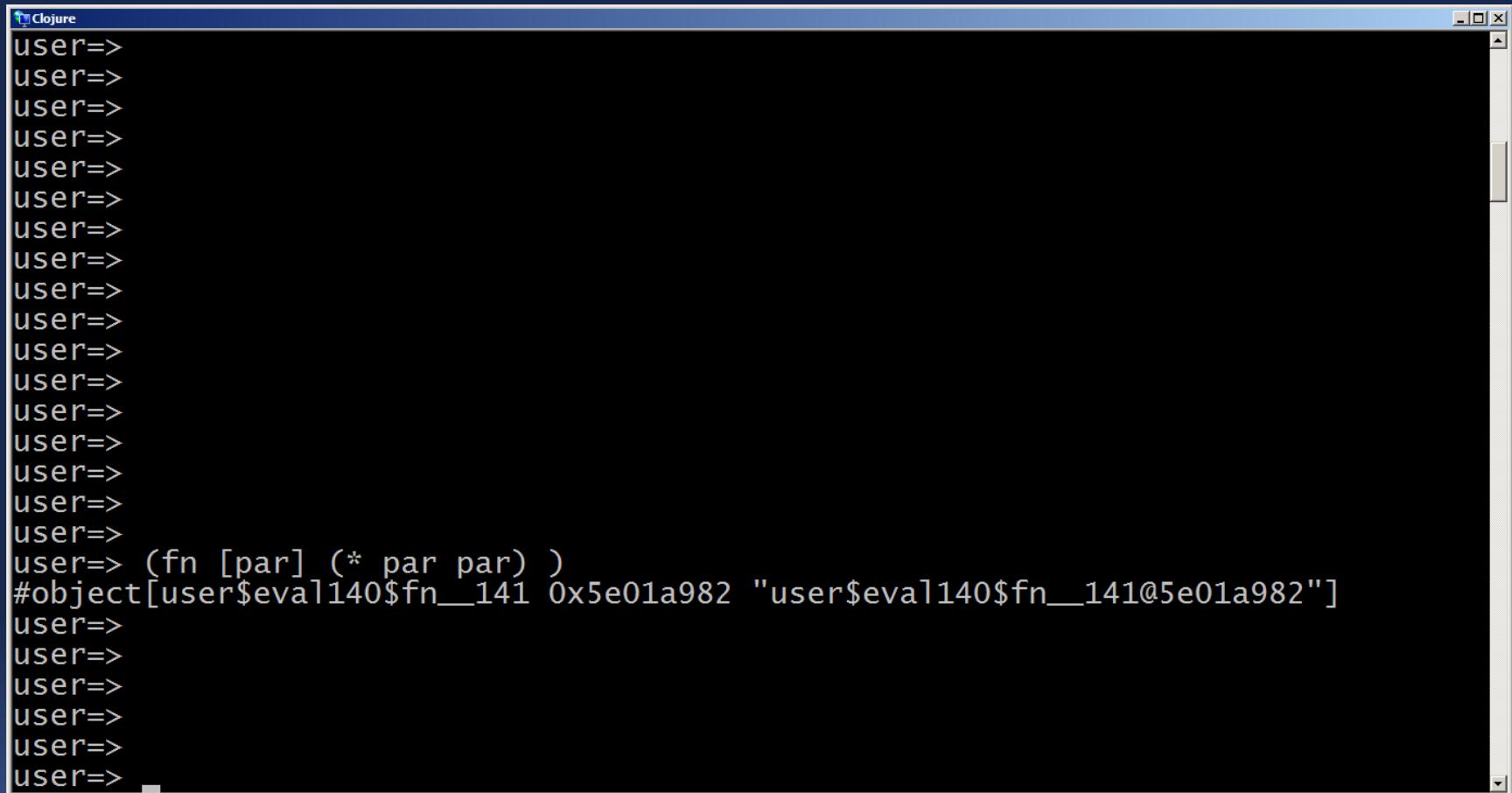
Atividade 9

- ✓ Abra o **REPL**;

- ✓ Com a macro **fn** defina uma função que recebe um parâmetro chamado **par** e retorna seu valor ao **quadrado** (**par** multiplicado por ele mesmo)

- ✓ Encerre o **REPL**.

Atividade 9



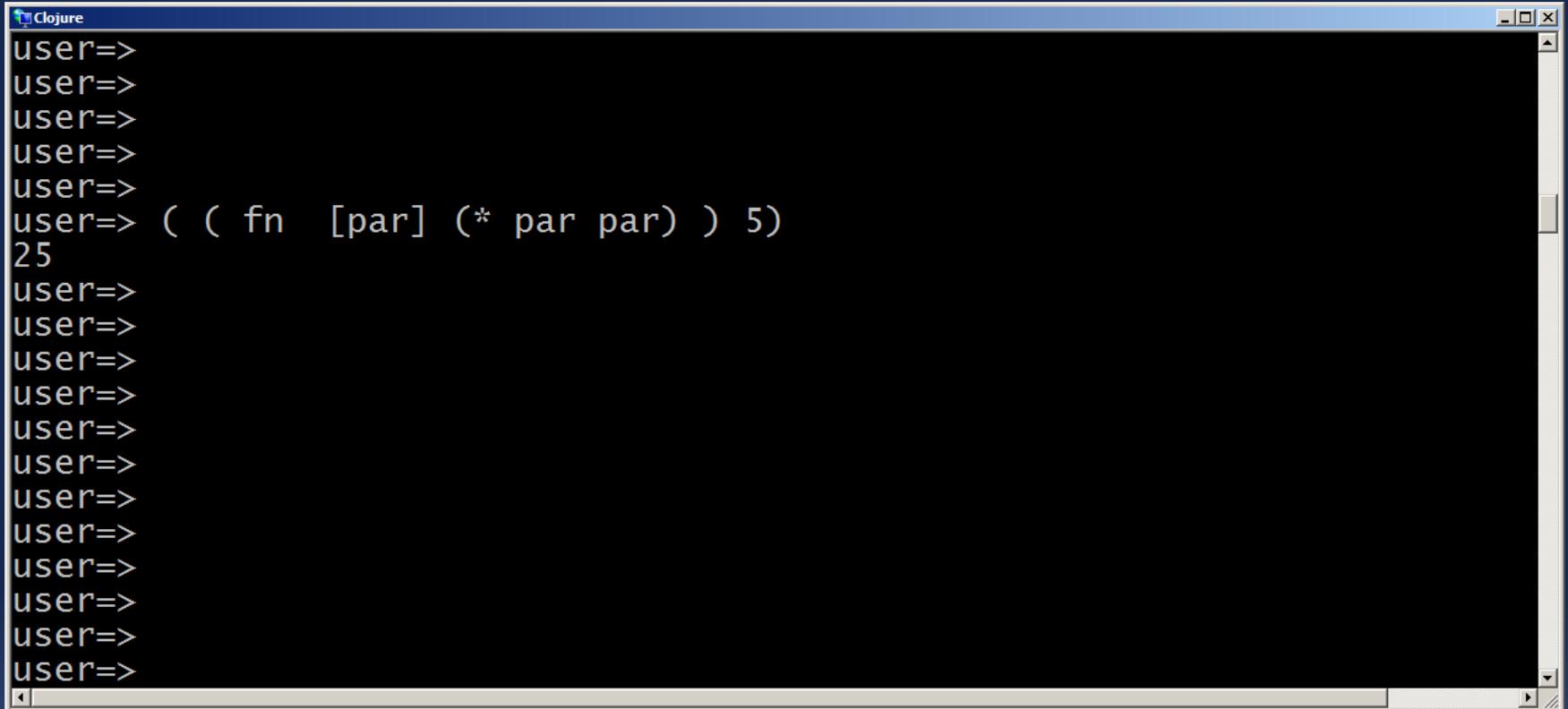
The screenshot shows a terminal window titled "Clojure". The user has defined a recursive function named fn_141. The code is as follows:

```
user=>
user=> (fn [par] (* par par) )
#object[user$eval140$fn__141 0x5e01a982 "user$eval140$fn__141@5e01a982"]
user=>
user=>
user=>
user=>
user=>
user=>
```

Atividade 10

- ✓ Abra o **REPL**;
- ✓ Com a macro **fn** defina uma função que recebe um parâmetro chamado **par** e retorna seu valor ao **quadrado** (**par** multiplicado por ele mesmo).
- ✓ Após a definição da função anônima (com **fn**) efetuar a aplicação da função passando a ela um argumento com o valor 5.
- ✓ Encerre o **REPL**.

Atividade 10



The screenshot shows a terminal window titled "Clojure". Inside, the following Clojure code is displayed:

```
user=>
user=>
user=>
user=>
user=>
user=> ( ( fn  [par] (* par par) ) 5)
25
user=>
```

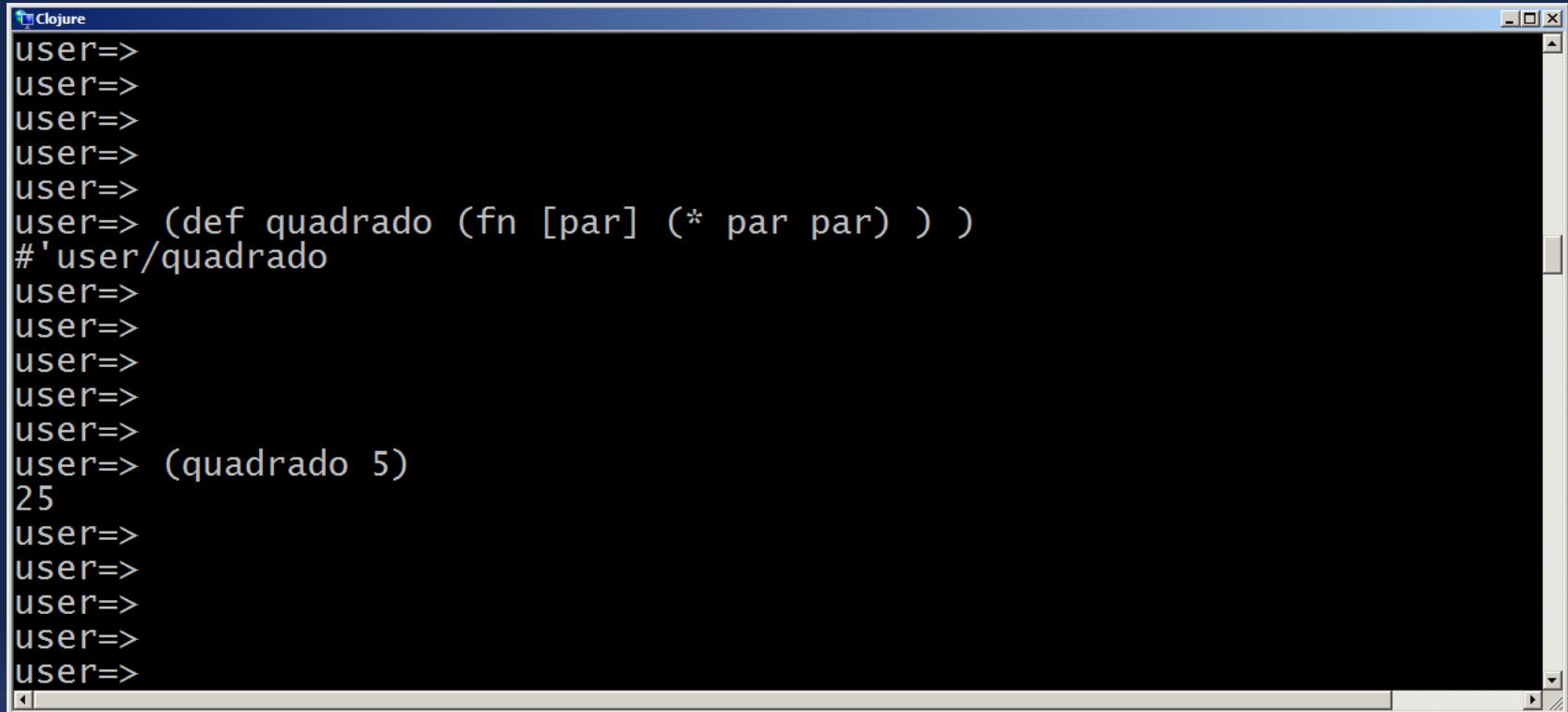
Observação: Nessa atividade, definimos uma função anônima e junto com a definição fizemos uma aplicação da função (execução) passando a ela um argumento com o valor 5. A função anônima retornou o quadrado de 5 que é 25.

Atividade 11

- ✓ Abra o **REPL**;
- ✓ Com a **macro fn** desenvolvida na atividade anterior, foi possível definirmos uma função de forma anônima e executá-la por meio da aplicação da função com o argumento passado, no caso 5.
- ✓ Mas, e se quizermos reaproveitar essa função ? Ou seja, reusá-la em outra ocasião ! Para esse caso, precisaríamos associar à essa função um nome que permitisse chamá-la em outra ocasião. Repita a atividade de forma que a função deixe de ser anônima e passe assim a ter um nome.
- ✓ Encerre o **REPL**.

Dica: Nessa atividade, para definirmos função com nome devemos usar a macro **def**.

Atividade 11



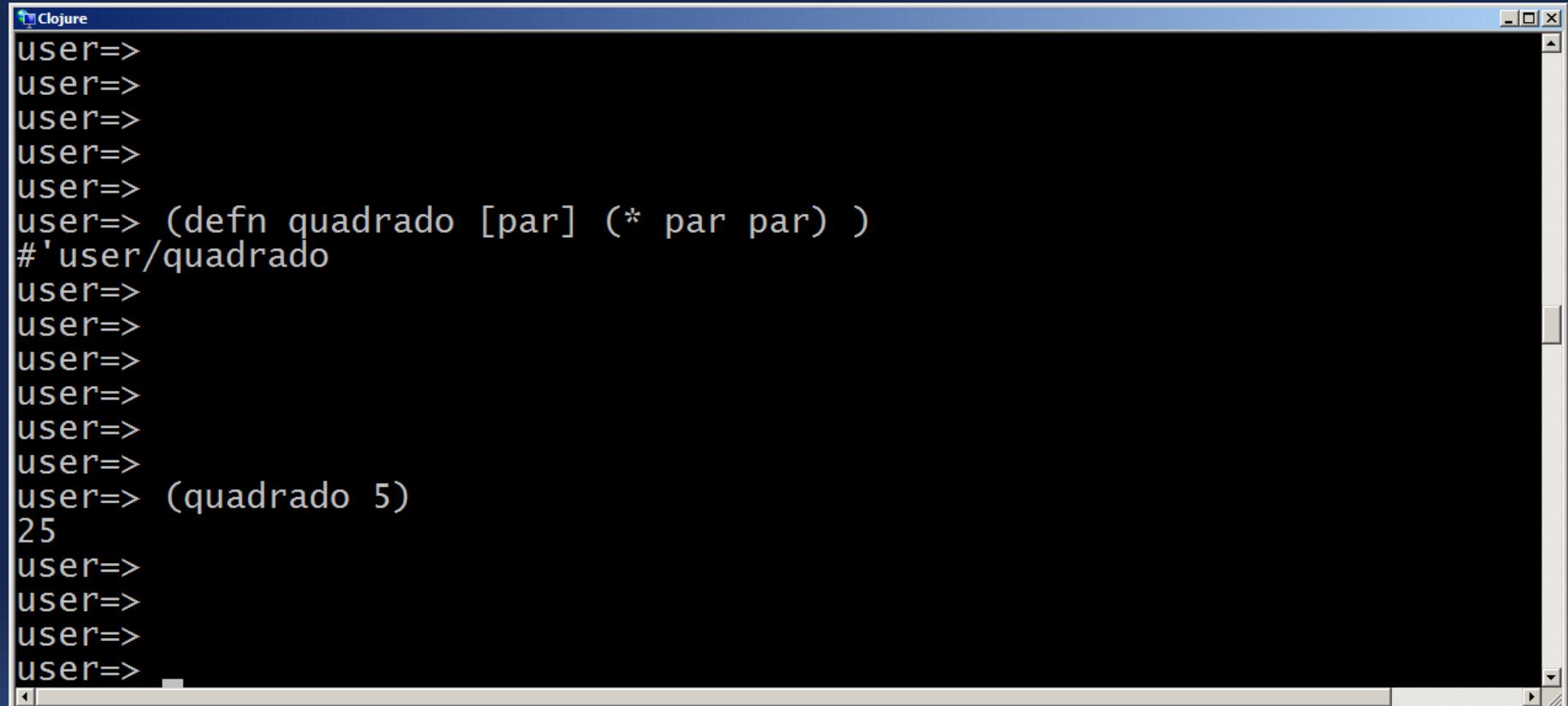
A screenshot of a Windows-style application window titled "Clojure". The window contains a black text area with white text representing a Clojure REPL session. The text shows the user defining a function named "quadrado" that takes one parameter and returns its square, then calling it with the argument 5, which results in the output 25.

```
Clojure
user=>
user=>
user=>
user=>
user=>
user=> (def quadrado (fn [par] (* par par) ) )
#'user/quadrado
user=>
user=>
user=>
user=>
user=>
user=> (quadrado 5)
25
user=>
user=>
user=>
user=>
user=>
```

Macro `defn`

- ✓ Vimos nas atividades anteriores que com a special form `fn` podemos criar funções anônimas.
- ✓ Vimos também que podemos retirar da função essa característica anônima, ou seja deixá-la reusável por meio da special form `def`.
- ✓ Essa combinação de `def` com `fn` é portanto bem usual;
- ✓ Em função disso, Clojure disponibiliza uma macro built-in para essa finalidade.
- ✓ Trata-se da macro `defn`.

Exemplo - Macro defn



The screenshot shows a Windows-style application window titled "Clojure". Inside, the Clojure REPL is running. The user has defined a macro named "quadrado" which takes one argument and multiplies it by itself. This macro is then used to calculate the square of 5, resulting in 25.

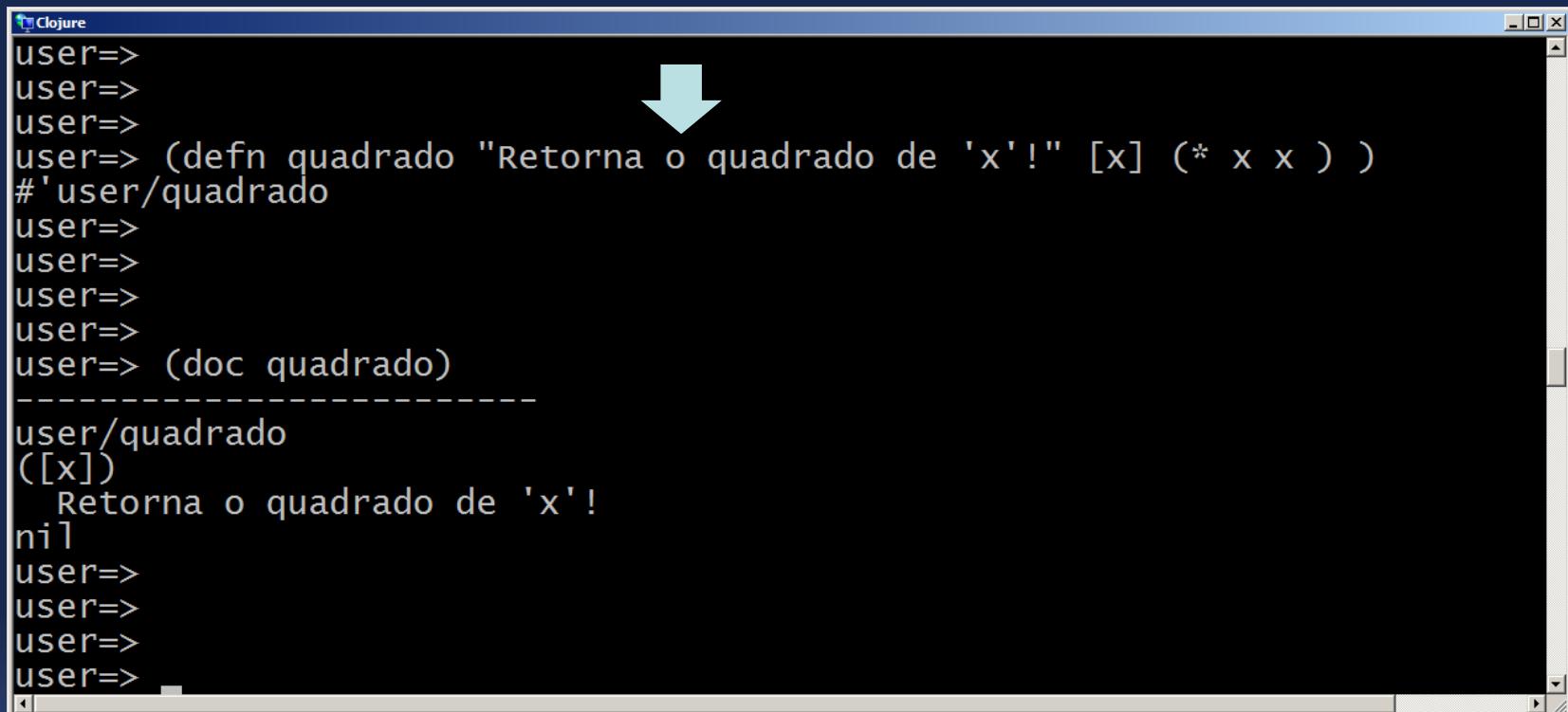
```
Clojure
user=>
user=>
user=>
user=>
user=>
user=> (defn quadrado [par] (* par par) )
#'user/quadrado
user=>
user=>
user=>
user=>
user=>
user=> (quadrado 5)
25
user=>
user=>
user=>
user=>
```

Exemplo - Macro defn

```
Clojure
user=>
user=> (defn funcao-hello [nome] (println (str "Hello, " nome) ) )
#'user/funcao-hello
user=>
user=>
user=>
user=>
user=>
user=>
user=> (funcao-hello "Maurício")
Hello, Maurício
nil
user=>
user=>
user=>
```

Adicionando documentação à função

- ✓ Para adicionar alguma documentação em uma função definida com a macro **defn**, basta acrescentar um **doc-string** antes dos argumentos da função !



The screenshot shows a terminal window titled "Clojure" with the following text:

```
user=>
user=>
user=>
user=> (defn quadrado "Retorna o quadrado de 'x'!" [x] (* x x) )
#'user/quadrado
user=>
user=>
user=>
user=>
user=> (doc quadrado)
-----
user/quadrado
([x])
  Retorna o quadrado de 'x'!
nil
user=>
user=>
user=>
user=>
```

A large blue arrow points downwards from the text "Para adicionar alguma documentação em uma função definida com a macro **defn**, basta acrescentar um **doc-string** antes dos argumentos da função !" to the word "quadrado" in the code.

Observação: O doc-string deve vir antes da definição dos parâmetros da função. Se for escrito após, será avaliado sequencialmente como parte do corpo da função, resultando naturalmente em erro!

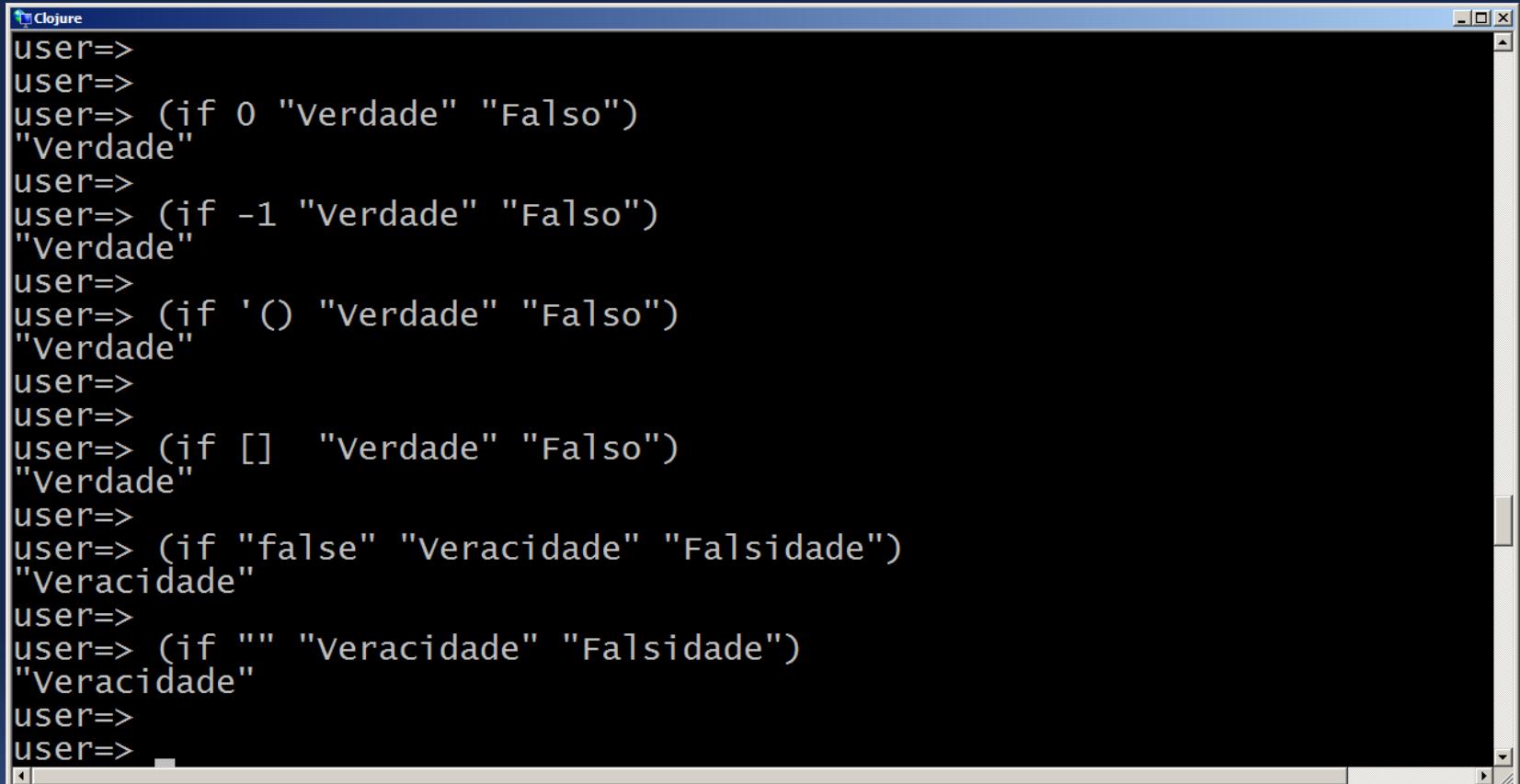
Veracidade, Falsidade e nil

- ✓ Na linguagem **Clojure**, nil representa ausência de valor; Corresponde à **NULL** em outras linguagens de programação;
- ✓ Representar ausência de valor é útil, pois permitir saber que "algo" está faltando;
- ✓ Em **Clojure**, **nil** se comporta como "**false**" quando for avaliado em uma expressão booleana;
- ✓ Em **Clojure**, **false** e **nil** são os **únicos** valores que são tratados como "**falsidade**". Tudo o mais é verdadeiro. Essa simples regra torna código **Clojure** mais robusto e confiável.

Veracidade, Falsidade e nil - Exemplos

```
Clojure
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=> (if nil "Veracidade" "Falsidade")
"Falsidade"
user=>
user=> (if false "Veracidade" "Falsidade")
"Falsidade"
user=>
user=>
user=>
user=>
user=>
user=>
```

Veracidade, Falsidade e nil - Exemplos

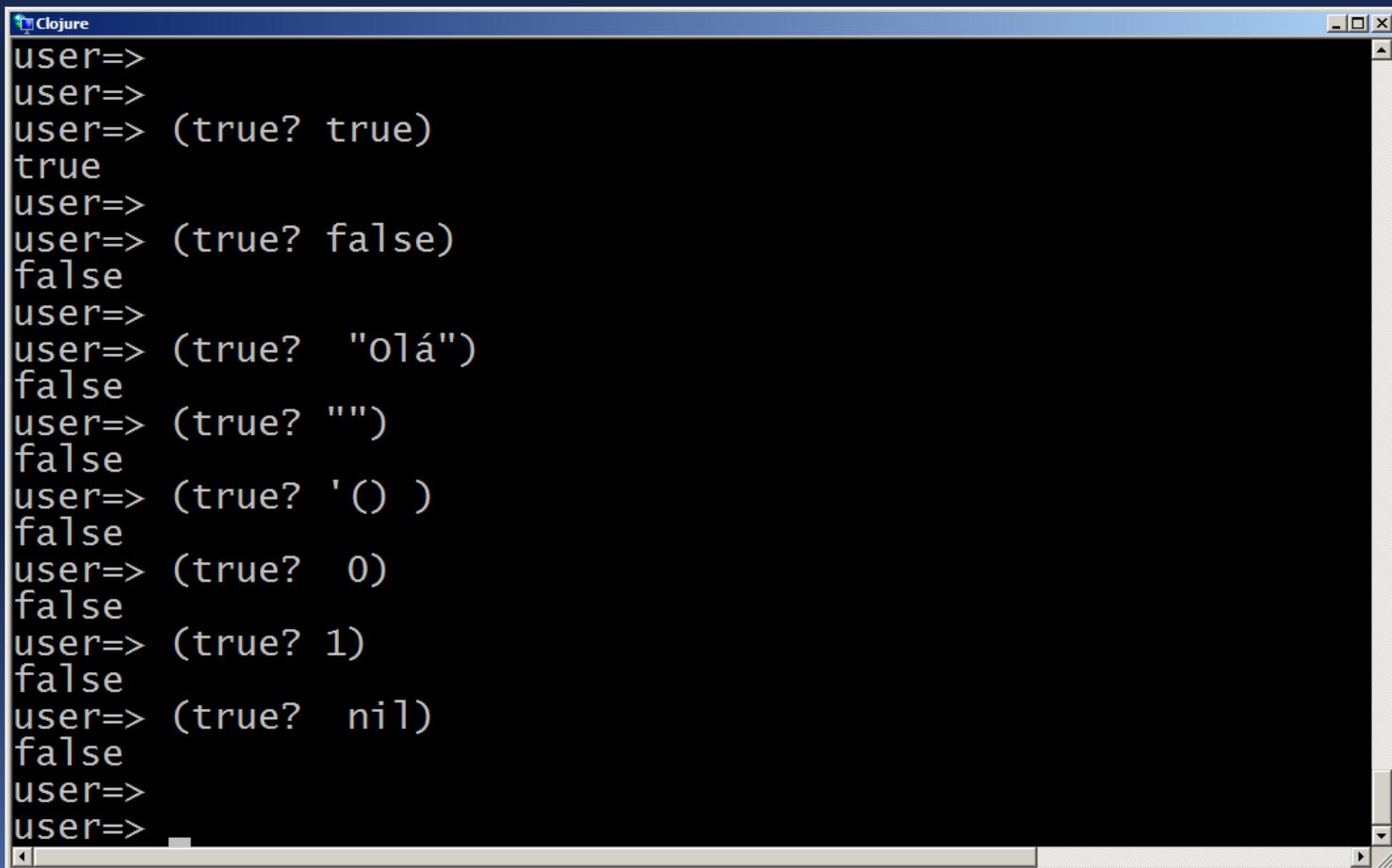


The screenshot shows a Windows-style application window titled "Clojure". Inside, a Clojure REPL session is running. The user has entered several if statements with different arguments to demonstrate how they evaluate to true or false. The results are printed back to the user. The session starts with "user=>" and ends with "user=>".

```
user=>
user=>
user=> (if 0 "Verdade" "Falso")
"Verdade"
user=>
user=> (if -1 "Verdade" "Falso")
"Verdade"
user=>
user=> (if '() "Verdade" "Falso")
"Verdade"
user=>
user=>
user=> (if [] "Verdade" "Falso")
"Verdade"
user=>
user=> (if "false" "Veracidade" "Falsidade")
"Veracidade"
user=>
user=> (if "" "Veracidade" "Falsidade")
"Veracidade"
user=>
user=>
```

Função true?

- ✓ A função **true?** retorna um valor booleano **true** ou **false** e permite checar se o parâmetro é **exatamente true** e não simplesmente tratado como **veracidade** ou **falsidade**.
- ✓ Assim, **true?** retorna true apenas quando o parâmetro for verdadeiramente **true**; Do contrário, sempre retornará **false**.

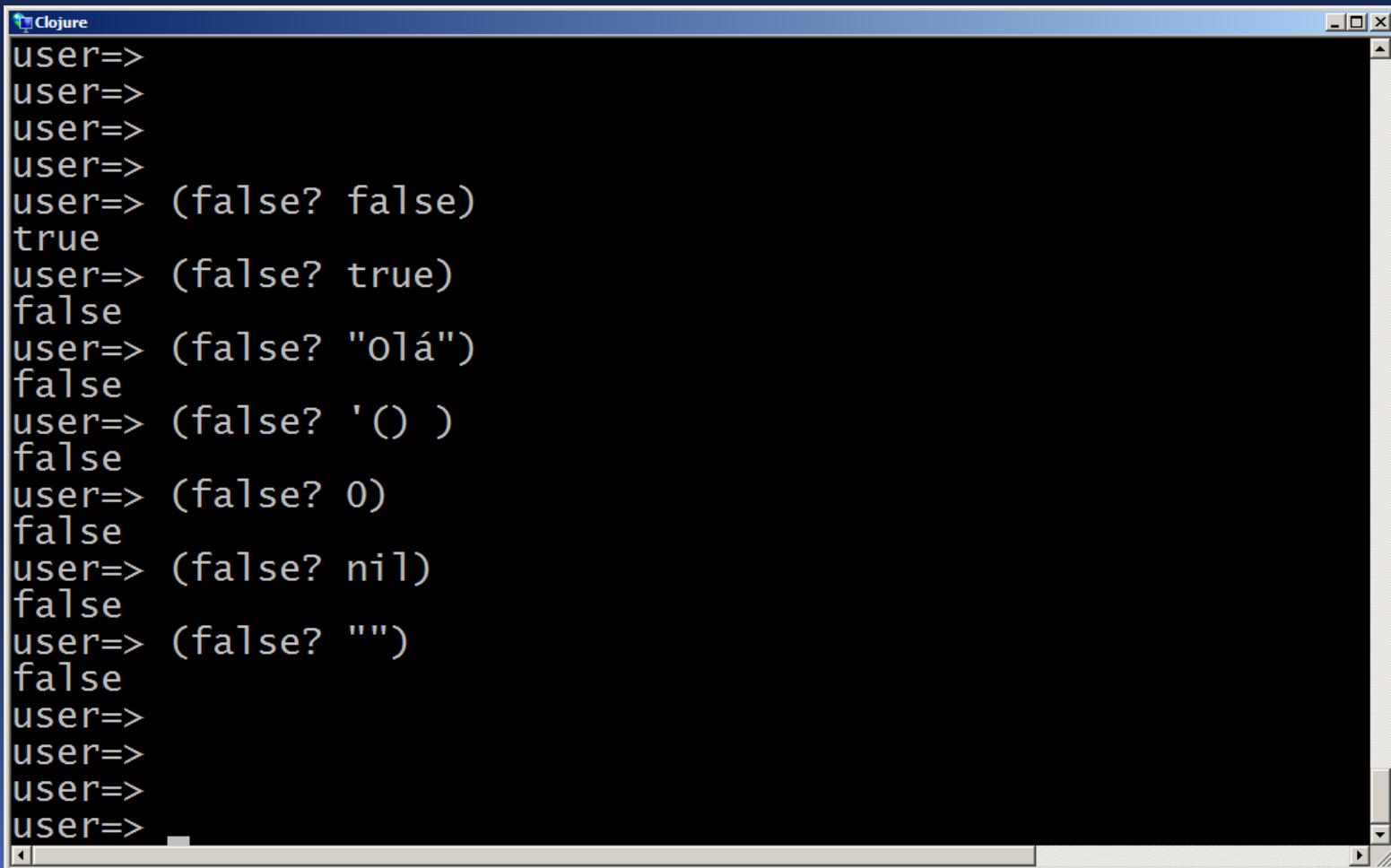


The screenshot shows a Windows-style application window titled "Clojure". Inside, the Clojure REPL is running. The user has typed several expressions using the `(true? ...)` function to check the truthiness of different values. The responses are as follows:

```
user=>
user=>
user=> (true? true)
true
user=>
user=> (true? false)
false
user=>
user=> (true? "Olá")
false
user=> (true? "")
false
user=> (true? '())
false
user=> (true? 0)
false
user=> (true? 1)
false
user=> (true? nil)
false
user=>
user=>
```

Função false?

- ✓ A função **false?** retorna um valor booleano **true** ou **false** e permite checar se o parâmetro é **exatamente false** e não simplesmente tratado como **veracidade** ou **falsidade**.
- ✓ Assim, **false?** retorna true apenas quando o parâmetro for verdadeiramente **false**; Do contrário, sempre retornará **false**.

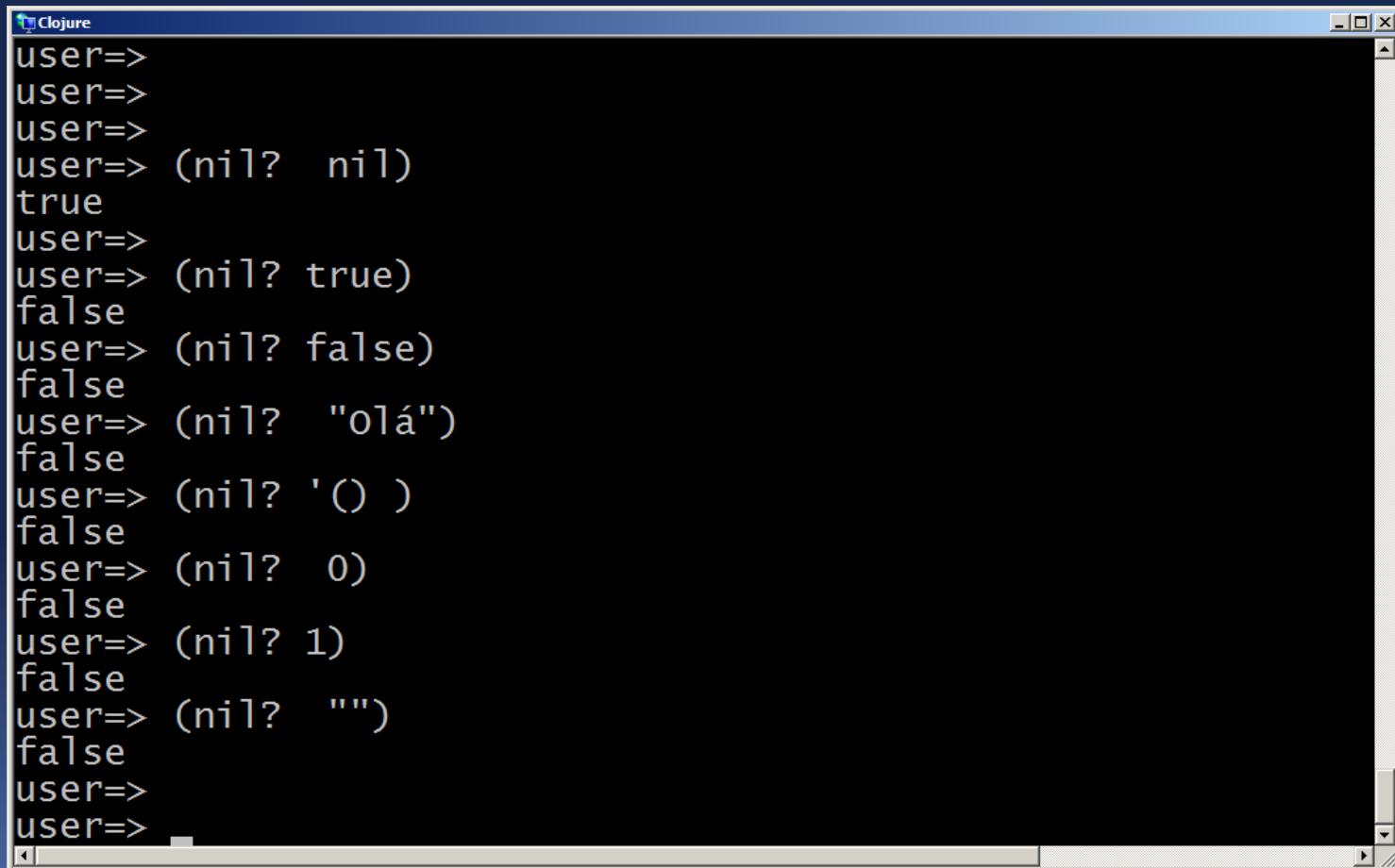


The screenshot shows a terminal window titled "Clojure" with a black background and white text. It displays a series of user inputs followed by their results, demonstrating the behavior of the `false?` function. The inputs are:

```
user=>
user=>
user=>
user=>
user=> (false? false)
true
user=> (false? true)
false
user=> (false? "Olá")
false
user=> (false? '() )
false
user=> (false? 0)
false
user=> (false? nil)
false
user=> (false? "")
false
user=>
user=>
user=>
user=>
```

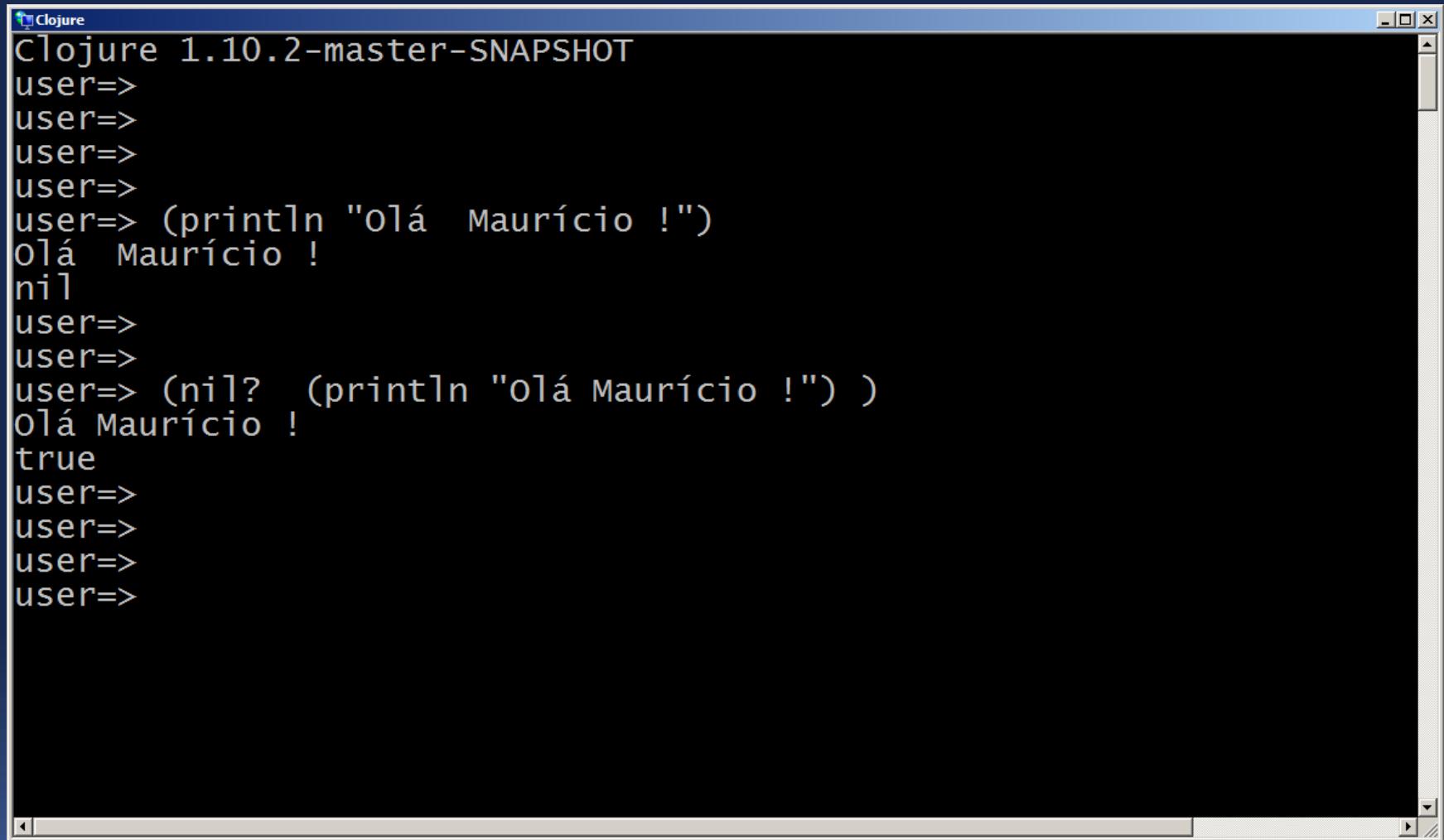
Função nil?

- ✓ A função **nil?** retorna um valor booleano **true** ou **false** e permite checar se o parâmetro é **exatamente nil** e não simplesmente tratado como **veracidade** ou **falsidade**.
- ✓ Assim, **nil?** retorna true apenas quando o parâmetro for verdadeiramente **nil**; Do contrário, sempre retornará **false**.



```
Clojure
user=>
user=>
user=>
user=> (nil? nil)
true
user=>
user=> (nil? true)
false
user=> (nil? false)
false
user=> (nil? "olá")
false
user=> (nil? '())
false
user=> (nil? 0)
false
user=> (nil? 1)
false
user=> (nil? "")
false
user=>
user=>
```

Exemplo interessante

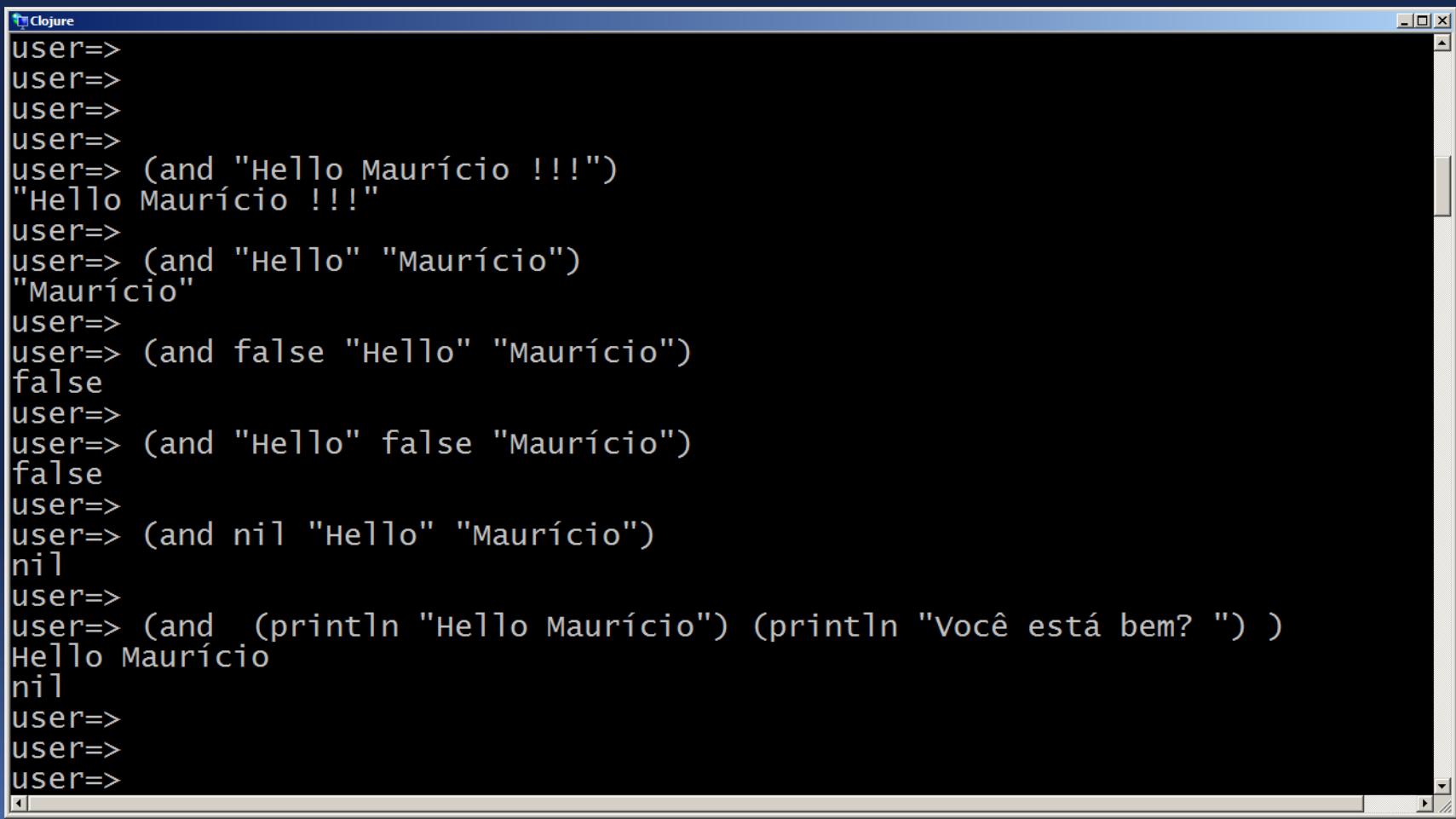


Clojure 1.10.2-master-SNAPSHOT

```
user=>
user=>
user=>
user=>
user=> (println "Olá Maurício !")
Olá Maurício !
nil
user=>
user=>
user=> (nil? (println "Olá Maurício !"))
Olá Maurício !
true
user=>
user=>
user=>
user=>
```

Macro and

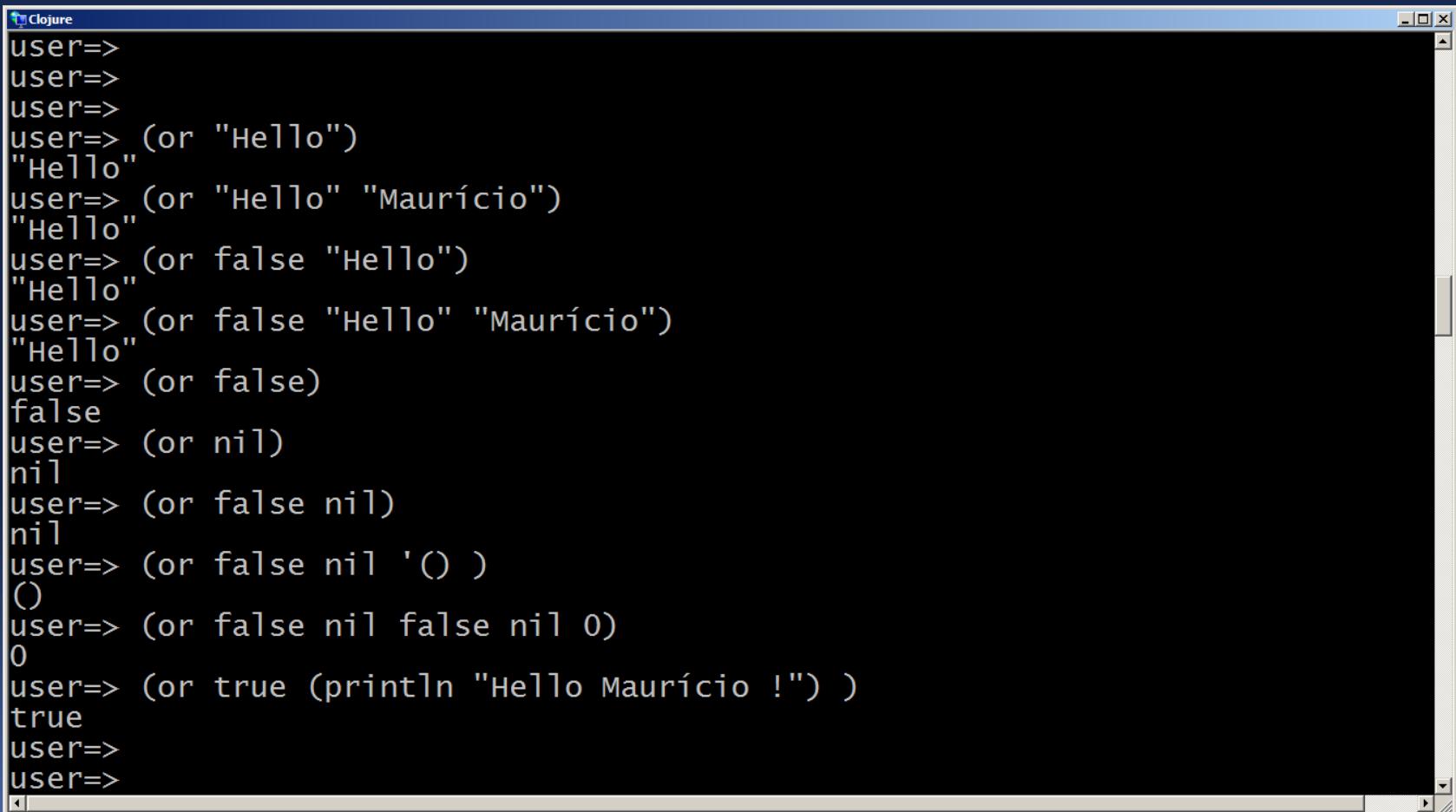
- ✓ A macro **and** retorna a primeira **falsidade** que encontrar (da esquerda para a direita) e **não** avaliará o restante da expressão quando for o caso;
- ✓ Quando todos os valores passados para a macro **and** resultarem em "veracidade", a macro **and** retorna o valor da última expressão.



```
Clojure
user=>
user=>
user=>
user=>
user=> (and "Hello Maurício !!!")
"Hello Maurício !!!"
user=>
user=> (and "Hello" "Maurício")
"Maurício"
user=>
user=> (and false "Hello" "Maurício")
false
user=>
user=> (and "Hello" false "Maurício")
false
user=>
user=> (and nil "Hello" "Maurício")
nil
user=>
user=> (and (println "Hello Maurício") (println "Você está bem? ") )
Hello Maurício
nil
user=>
user=>
user=>
```

Macro or

- ✓ A macro **or** retorna a primeira **veracidade** que encontrar (da esquerda para a direita) e **não** avaliará o restante da expressão quando for o caso;
- ✓ Quando todos os valores passados para a macro **or** resultarem em "falsidade", a macro **or** retorna false ou nil, dependendo do caso.

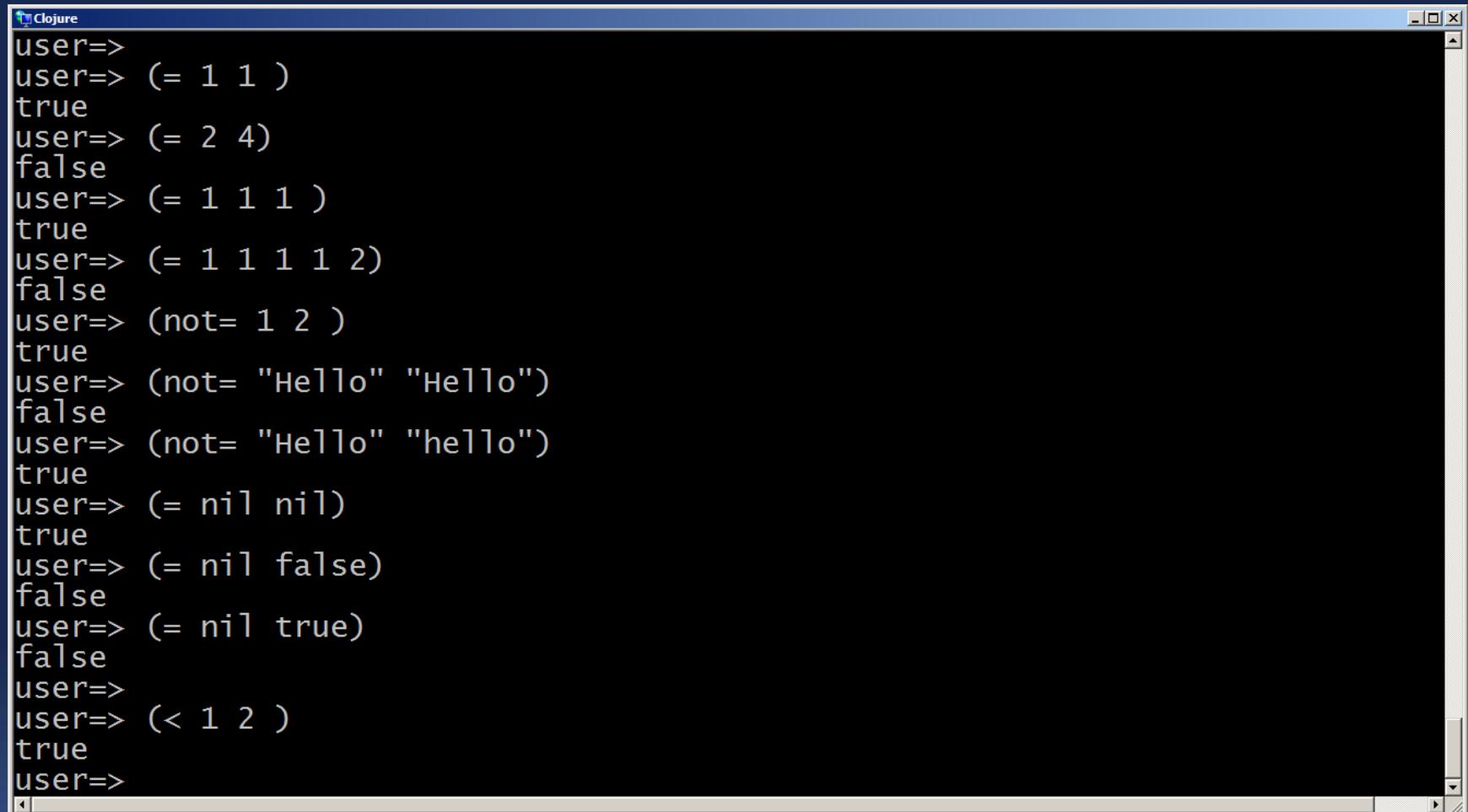


```
Clojure
user=>
user=>
user=>
user=> (or "Hello")
"Hello"
user=> (or "Hello" "Maurício")
"Hello"
user=> (or false "Hello")
"Hello"
user=> (or false "Hello" "Maurício")
"Hello"
user=> (or false)
false
user=> (or nil)
nil
user=> (or false nil)
nil
user=> (or false nil '())
()
user=> (or false nil false nil 0)
0
user=> (or true (println "Hello Maurício !"))
true
user=>
user=>
```

Operações de Equalidade

- ✓ Na maioria das linguagens de programação o símbolo `=` é usado para operações de atribuição. Porém em **Clojure**, bindings de símbolos à valores são feitos pelas special forms **def** e **defn**;
- ✓ Em **Clojure**, o símbolo `=` está associado à uma função para equalidade e retorna `true` se todos os argumentos forem iguais.
- ✓ Todos as outras operações de equalidade (`>` , `>=` , `<` , `<=`) são também implementações de funções.

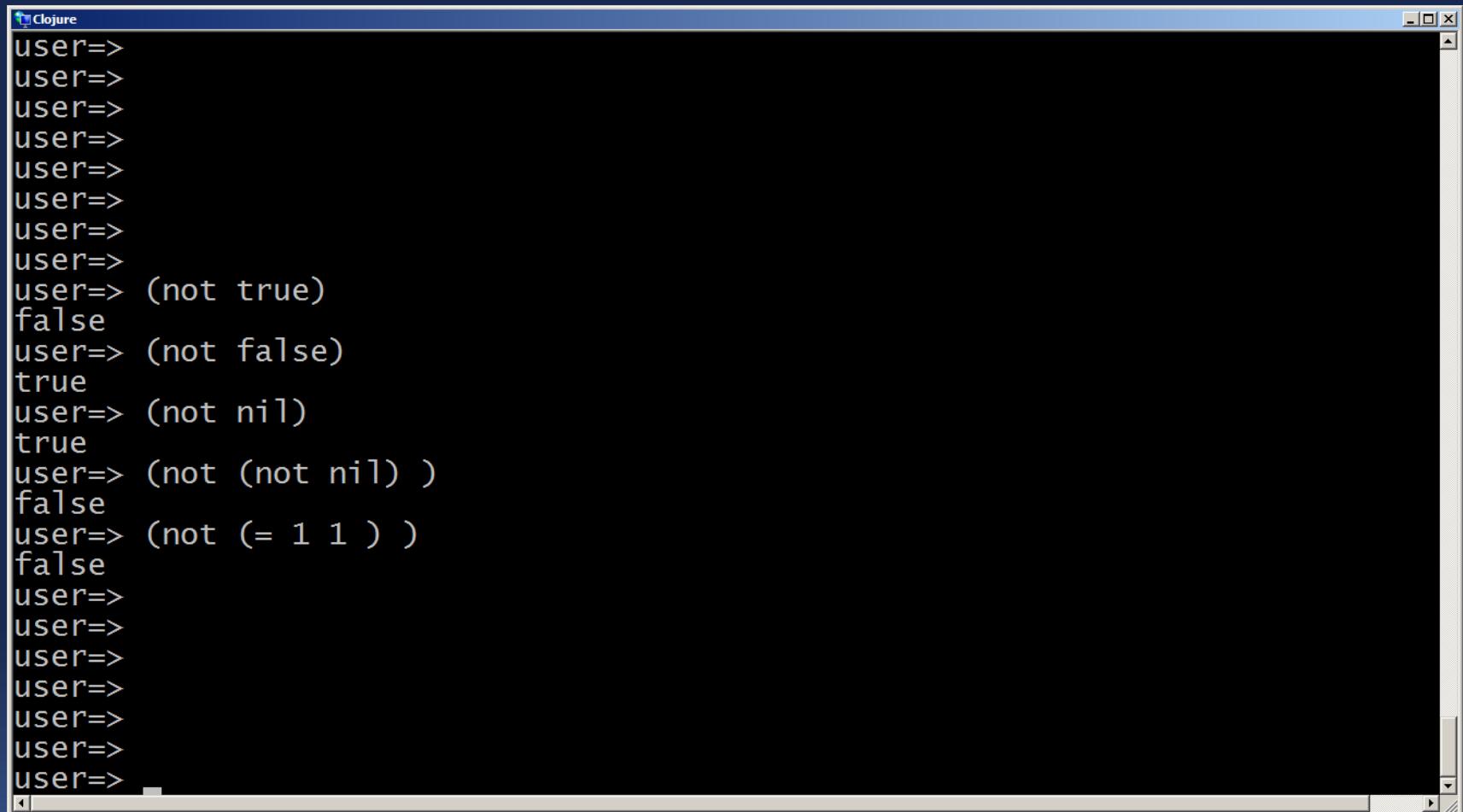
Operações de Equalidade



The screenshot shows a Windows-style application window titled "Clojure". Inside, a Clojure REPL session is running, demonstrating various equality operators. The session starts with `user=>` followed by several examples of `=`, `true`, and `false` being printed. It then shows examples of `not=` and `true/false` being printed. Finally, it shows examples of `nil` and `<` being used.

```
Clojure
user=>
user=> (= 1 1 )
true
user=> (= 2 4)
false
user=> (= 1 1 1 )
true
user=> (= 1 1 1 1 2)
false
user=> (not= 1 2 )
true
user=> (not= "Hello" "Hello")
false
user=> (not= "Hello" "hello")
true
user=> (= nil nil)
true
user=> (= nil false)
false
user=> (= nil true)
false
user=>
user=> (< 1 2 )
true
user=>
```

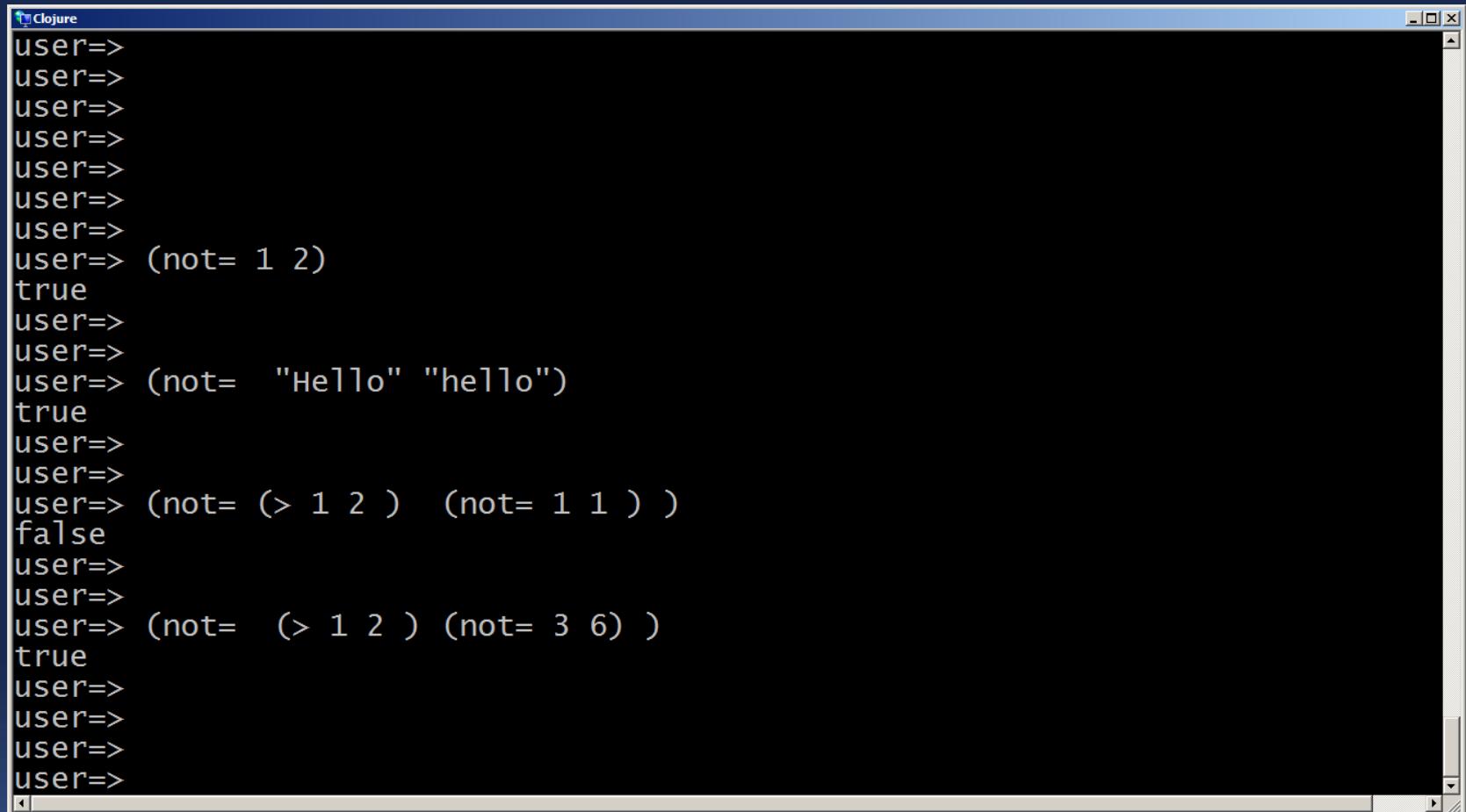
Operações de Equalidade



The screenshot shows a terminal window titled "Clojure" with a blue header bar. The window contains a series of Clojure expressions and their results, demonstrating various equality checks:

```
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=> (not true)
false
user=> (not false)
true
user=> (not nil)
true
user=> (not (not nil) )
false
user=> (not (= 1 1 ) )
false
user=>
user=>
user=>
user=>
user=>
user=>
```

Operações de Equalidade



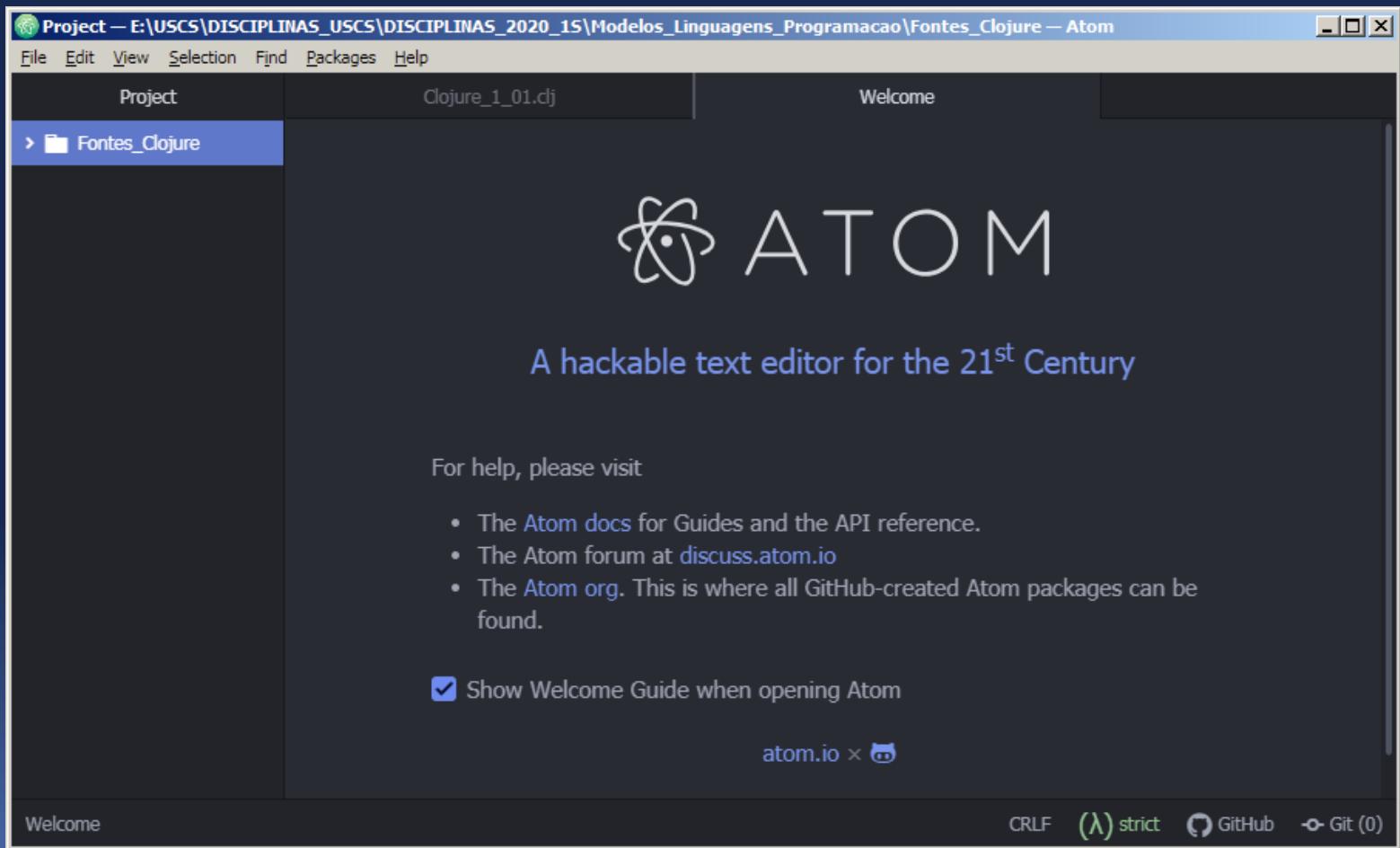
The screenshot shows a terminal window titled "Clojure" with a black background and white text. It displays a series of Clojure expressions and their results, illustrating the use of the `(not=)` operator for inequality. The session starts with several blank "user=>" prompts, followed by the first expression:

```
user=>
user=>
user=>
user=>
user=>
user=>
user=>
user=> (not= 1 2)
true
user=>
user=>
user=> (not= "Hello" "hello")
true
user=>
user=>
user=> (not= (> 1 2) (not= 1 1))
false
user=>
user=>
user=> (not= (> 1 2) (not= 3 6))
true
user=>
user=>
user=>
user=>
```

Operações de Equalidade

```
Clojure
user=>
user=>
user=>
user=>
user=>
user=>
user=> (not= nil nil)
false
user=>
user=>
user=> (not= nil false)
true
user=>
user=> (not= true nil)
true
user=>
user=> (not= true false)
true
user=>
user=> (not= false nil)
true
user=>
user=>
user=>
user=>
```

Execução de Código Clojure no Atom Package Chlorine



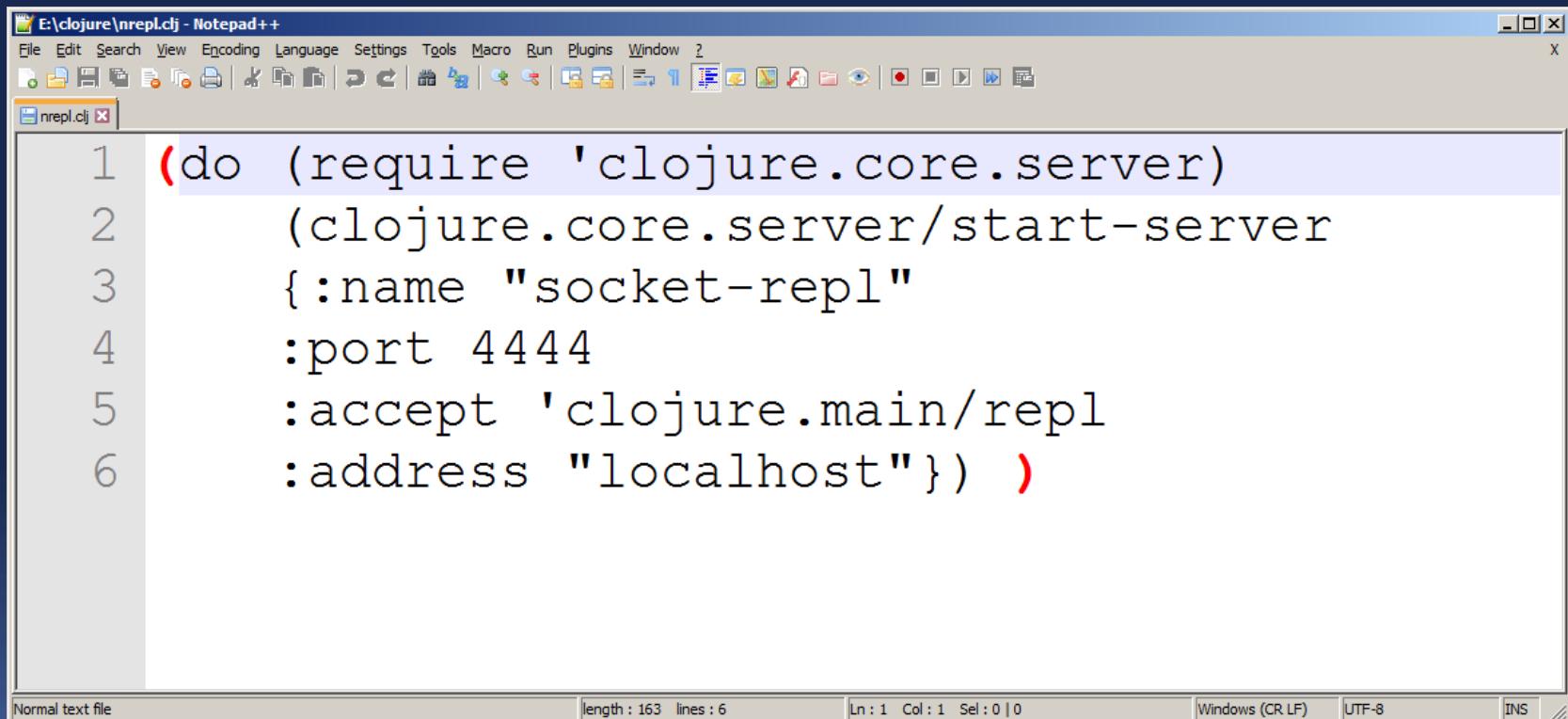
Ativando REPL Remoto

```
(do (require 'clojure.core.server)
  (clojure.core.server/start-server
    {:name "socket-repl"
     :port 4444
     :accept 'clojure.main/repl
     :address "localhost"}))
```



Salvando código num file .clj

- ✓ Criar arquivo .clj com código
- ✓ Estamos chamando o arquivo de nrepl.clj
- ✓ Será salvo no diretório: E:/clojure



The screenshot shows a Notepad++ window titled "E:\clojure\nrepl.clj - Notepad++". The window contains the following Clojure code:

```
1 (do (require 'clojure.core.server)
      (clojure.core.server/start-server
       {:name "socket-repl"
        :port 4444
        :accept 'clojure.main/repl
        :address "localhost"}) )
```

The code is a Clojure script that requires the 'clojure.core.server' namespace and starts a server named "socket-repl" on port 4444, accepting connections from 'clojure.main/repl' at the address "localhost". The line numbers 1 through 6 are shown on the left.

Ativando REPL Remoto

Digitando-se o código na console

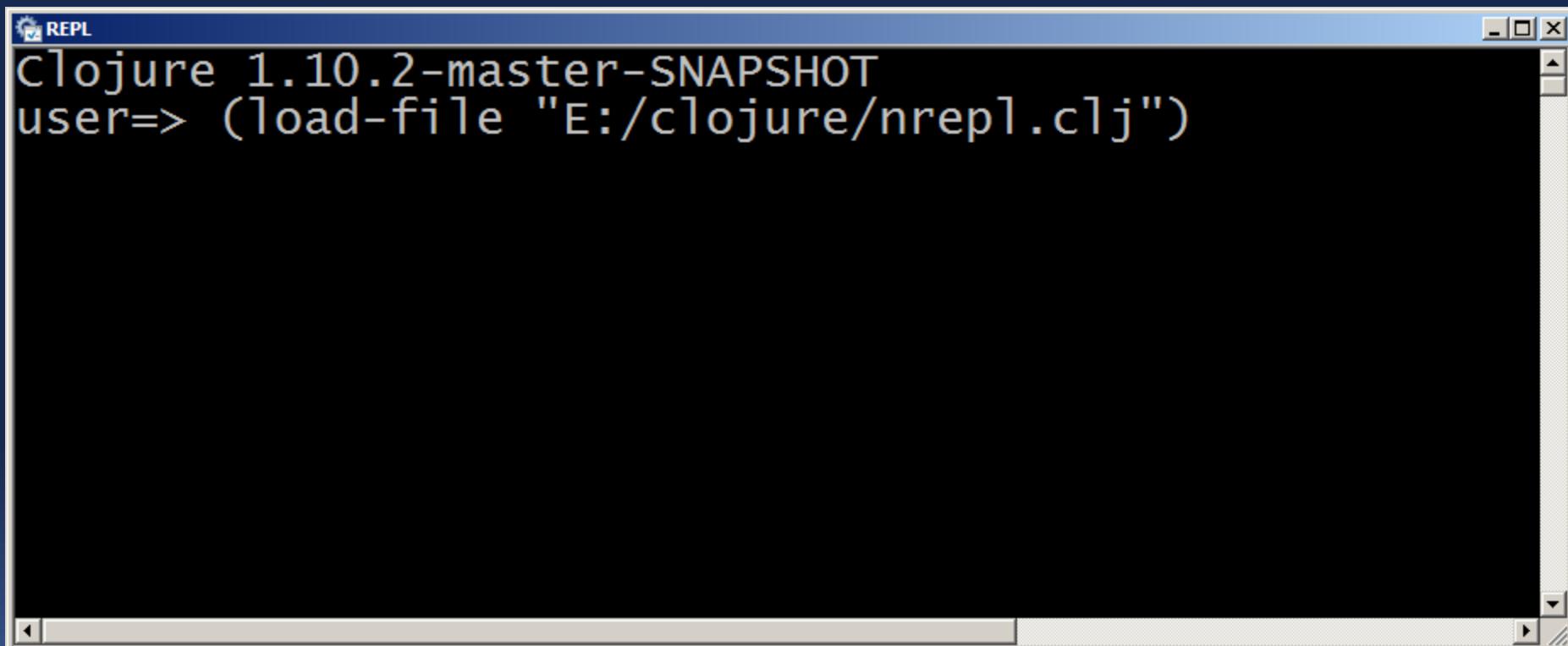
```
Clojure 1.10.2-master-SNAPSHOT
user=> (do (require 'clojure.core.server)
(clojure.core.server/start-server
{:name "socket-repl"
:port 4444
:accept 'clojure.main/repl
:address "localhost"})
#object[java.net.ServerSocket 0x43f82e78 "ServerSocket[addr=localhost/127.0.0.1,
localport=4444]"]
user=> -
```



Ativando REPL Remoto

Carregando-se arquivo digitado anteriormente

> (load-file “E:/clojure/nrepl.clj”)



A screenshot of a Clojure REPL window titled "REPL". The window shows the command "user=> (load-file "E:/clojure/nrepl.clj")" entered at the prompt. The window has a standard Windows-style title bar and scroll bars.

Ativando REPL Remoto

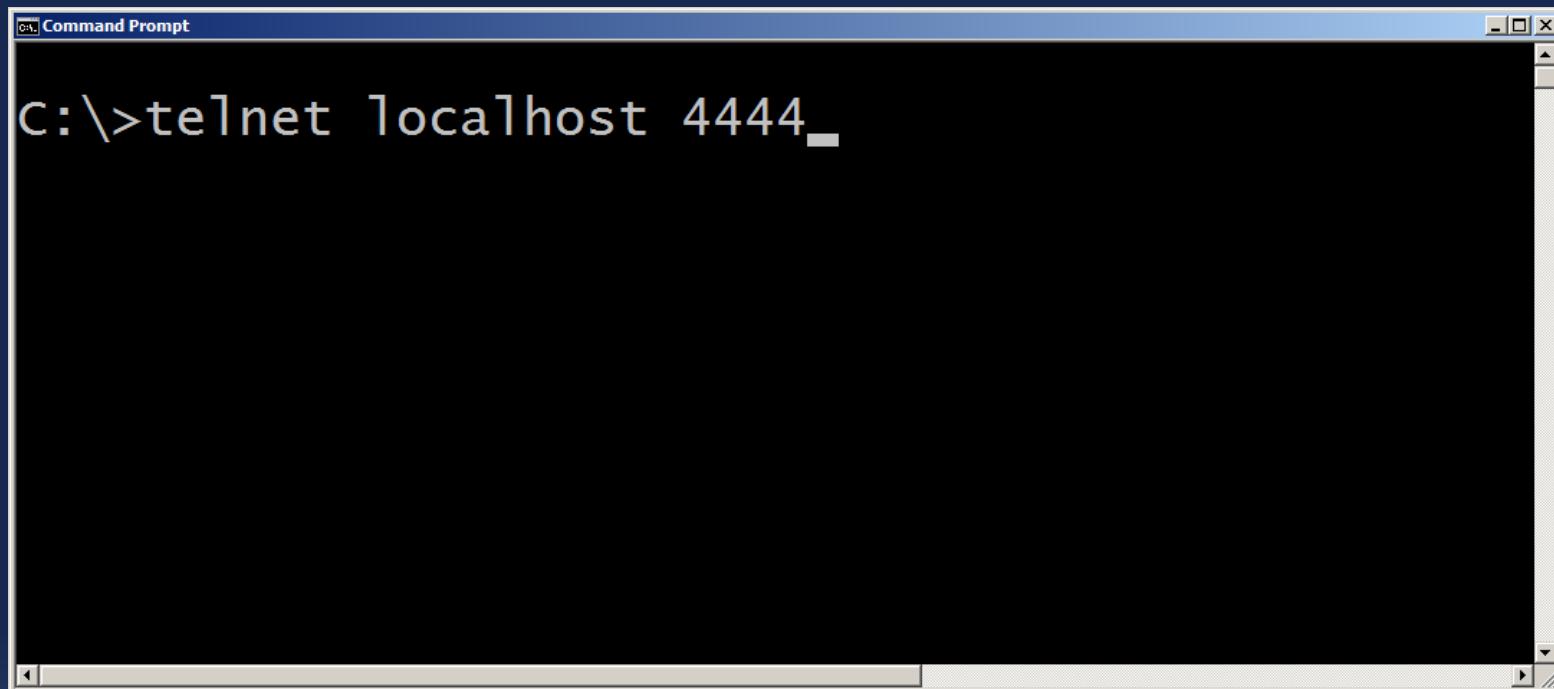
Carregando-se arquivo digitado anteriormente

> (load-file “E:/clojure/nrepl.clj”)

```
REPL
Clojure 1.10.2-master-SNAPSHOT
user=> (load-file "E:/clojure/nrepl.clj")
#object[java.net.ServerSocket 0x12ed9db6 "ServerSocket
localport=4444"]
user=>
```

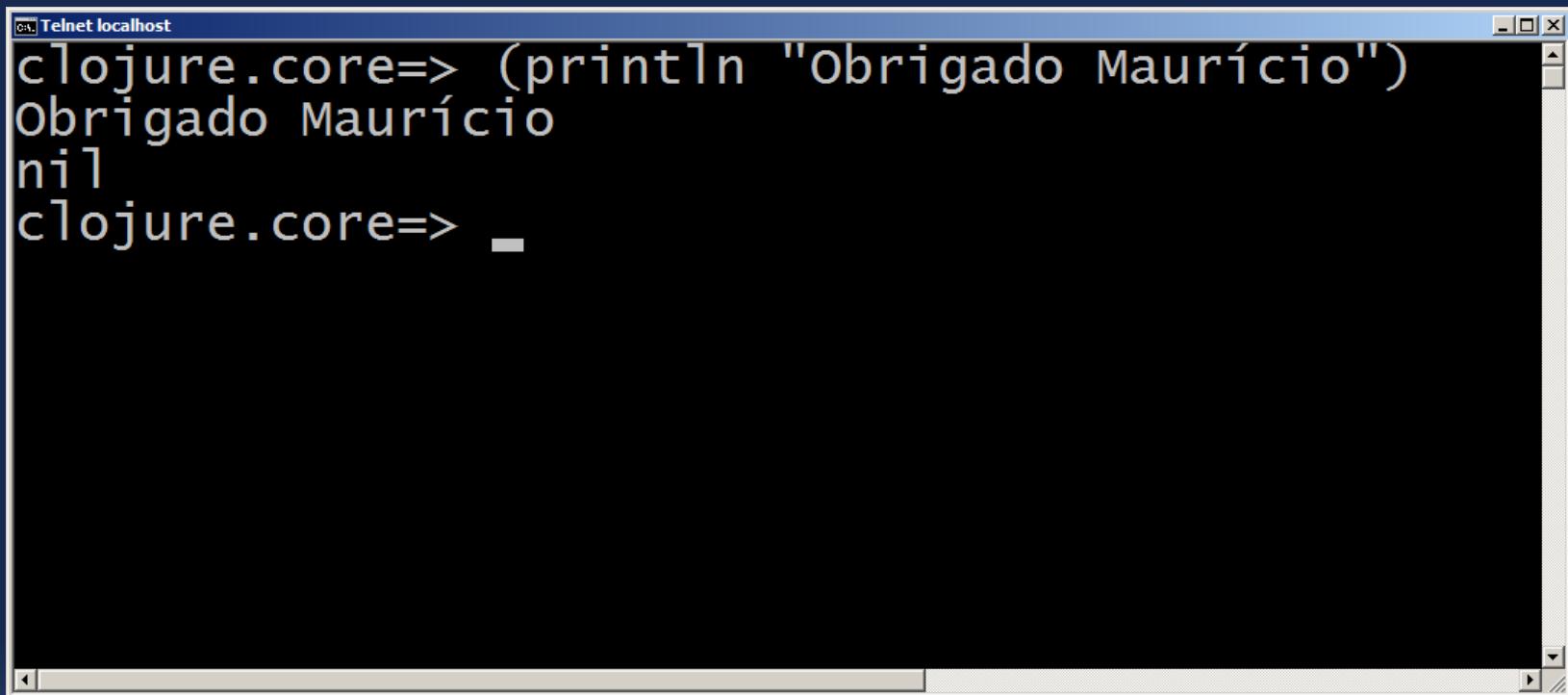


Conectando com Telnet na porta 4444



A screenshot of a Windows Command Prompt window titled "Command Prompt". The window has a blue header bar with the title and standard window controls (minimize, maximize, close). The main area is black with white text. The text shows the command "c:\>telnet localhost 4444" followed by a cursor underscore, indicating the command is being typed or has just been typed.

Conectando com Telnet na porta 4444

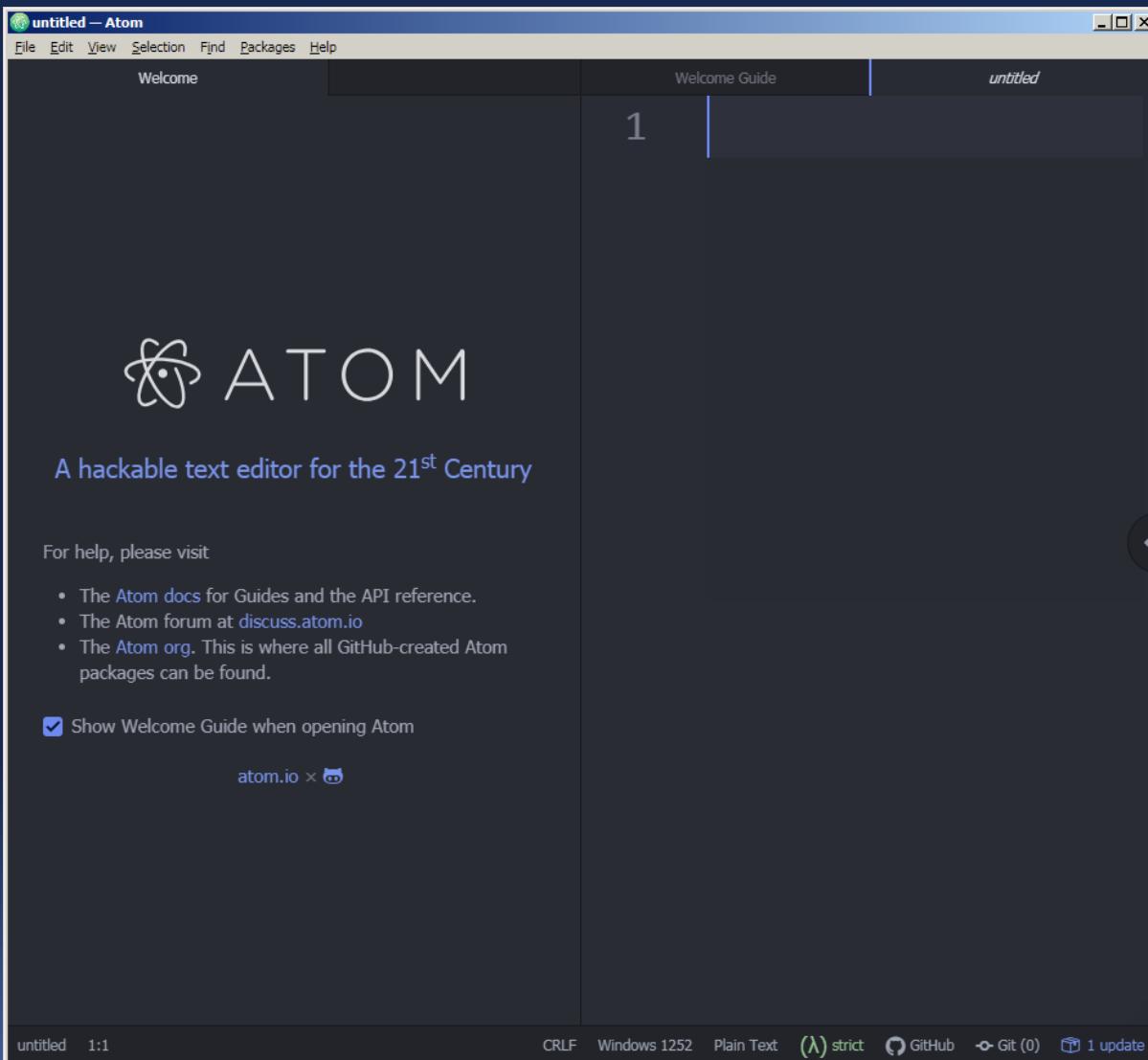


A screenshot of a Windows Telnet window titled "Telnet localhost". The window contains the following Clojure code:

```
clojure.core=> (println "Obrigado Maurício")
Obrigado Maurício
nil
clojure.core=> _
```

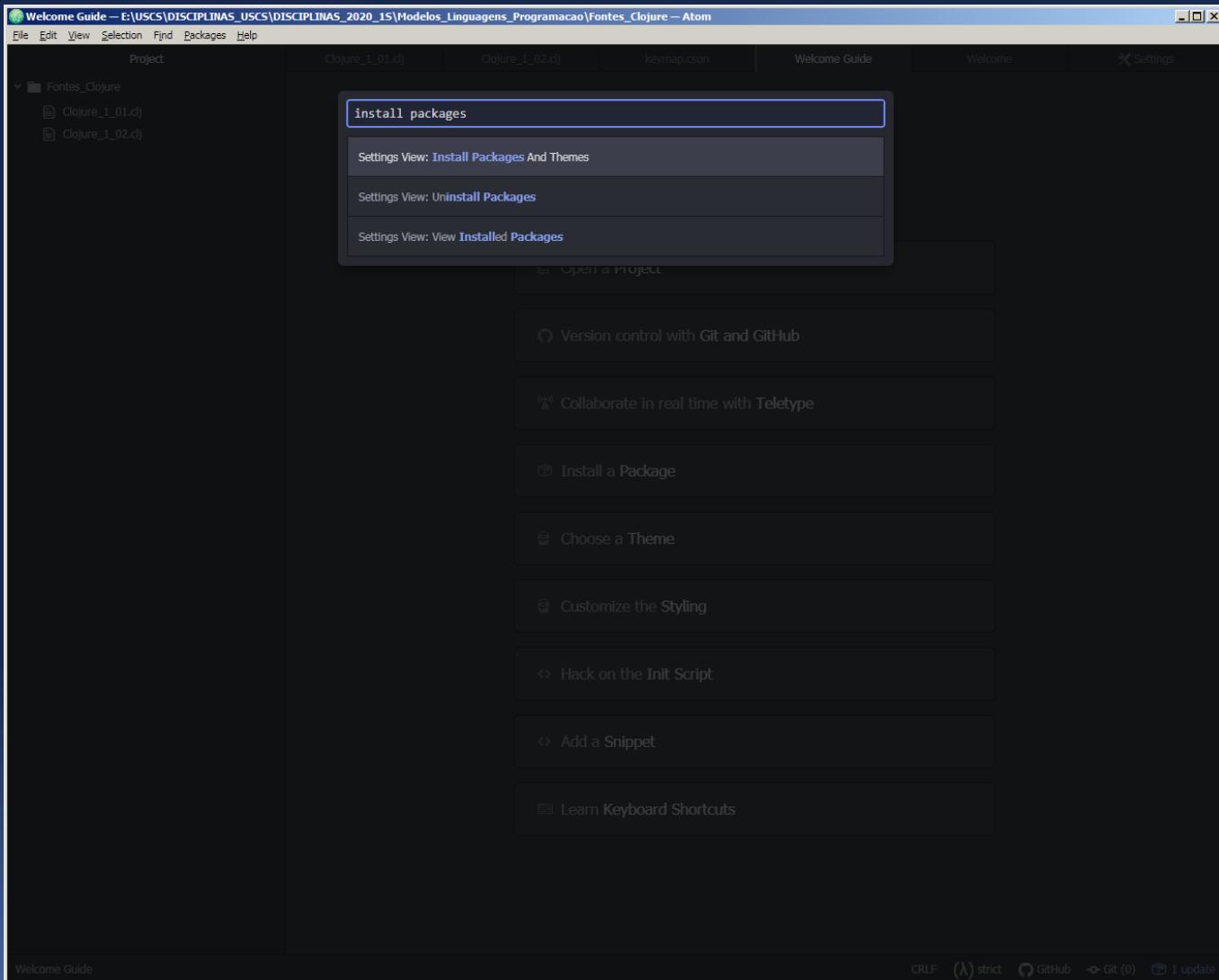
Desenvolvimento Clojure com IDE's

Código Clojure no Atom



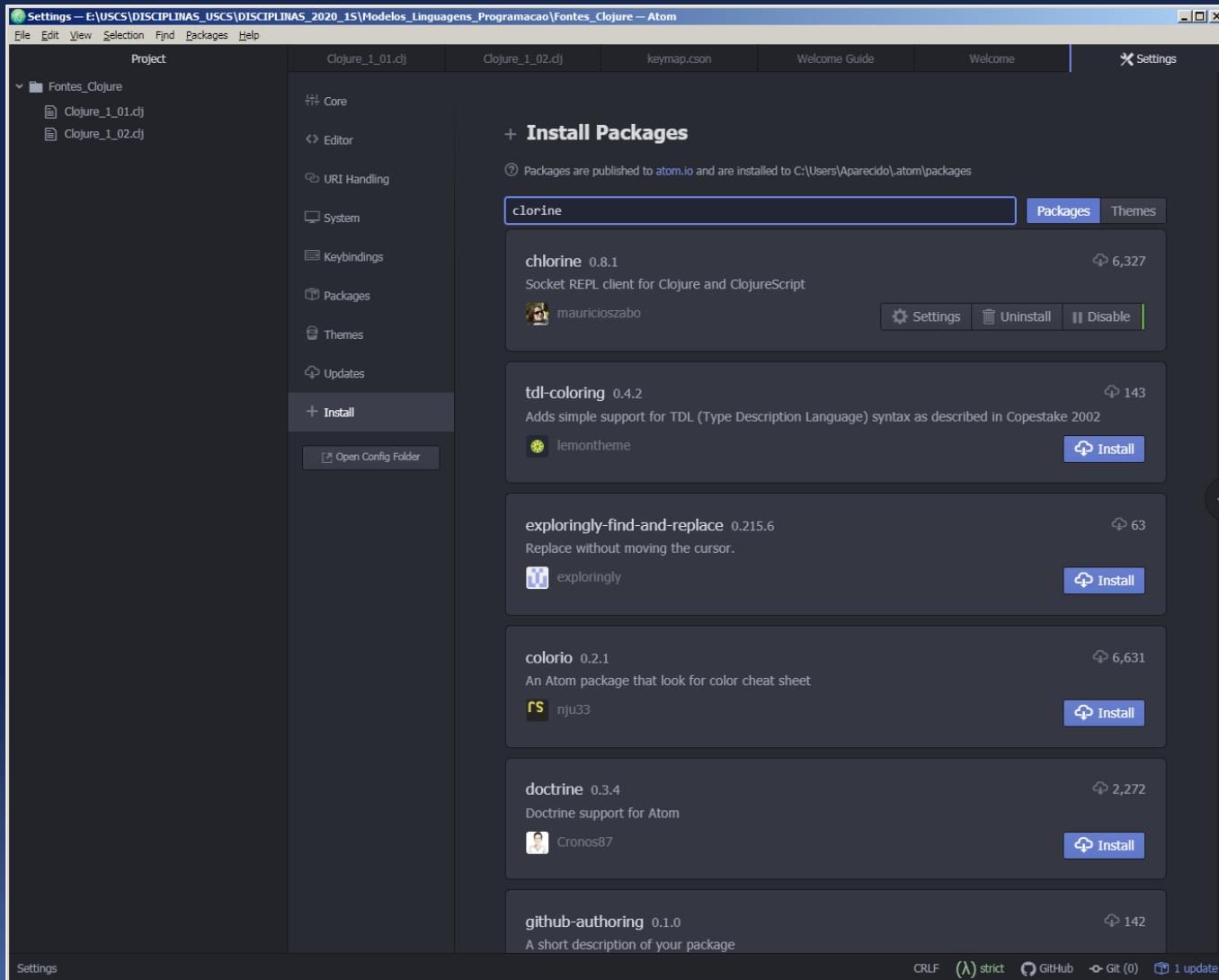
Atom – Package Chlorine

✓ **Ctrl + Shift + p** > **Install Packages and Themes**



Atom – Package Chlorine

✓ Instalar => package **Chlorine**



Chlorine – Configuração de Hot Keys

- ✓ Instalar => package **Chlorine**
- ✓ Ao se telcar **CTRL+SHIFT+p** e procurar por "Open your keymap", Atom irá abrir um arquivo pra customizar hotkeys;
- ✓ Nesse arquivo podem ser incluídas as configurações:

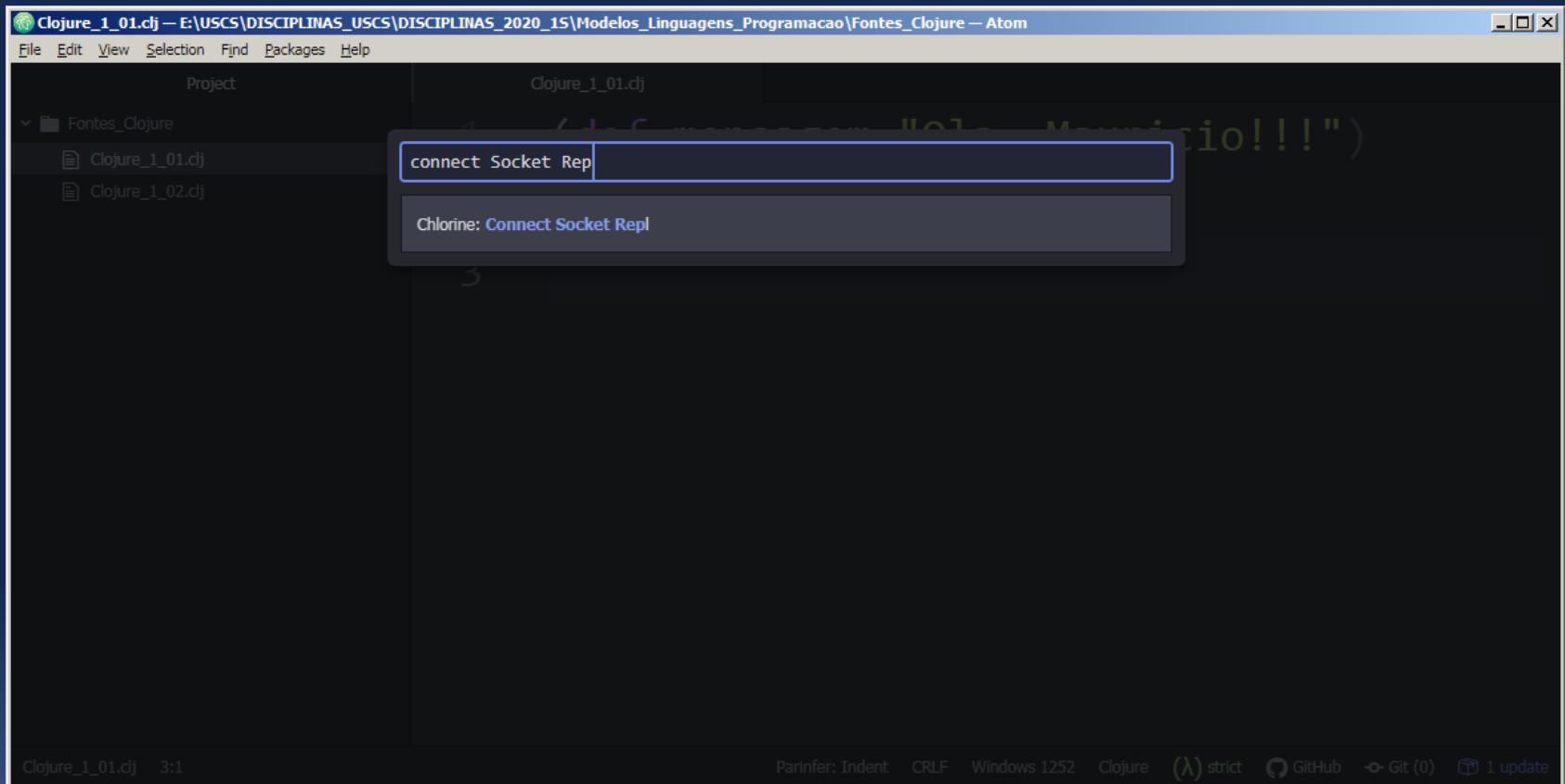
```
'atom-text-editor':  
  'ctrl-k': 'chlorine:clear-console'  
  'ctrl-shift-I': 'chlorine:load-file'  
  'ctrl-shift-l': 'chlorine:clear-inline-results'  
  'ctrl-shift-enter': 'chlorine:evaluate-block'  
  'ctrl-enter': 'chlorine:evaluate-top-block'  
  'ctrl-c': 'chlorine:break-evaluation'  
  'ctrl-d': 'chlorine:doc-for-var'
```

Chlorine – Configuração de Hot Keys

```
# Atom Flight Manual:  
# http://flight-manual.atom.io/using-atom/sections/basic-customization/  
  
'atom-text-editor':  
  'ctrl-k':                      'chlorine:clear-console'  
  'ctrl-shift-I':                 'chlorine:load-file'  
  'ctrl-shift-L':                 'chlorine:clear-inline-results'  
  'ctrl-shift-enter':              'chlorine:evaluate-block'  
  'ctrl-enter':                   'chlorine:evaluate-top-block'  
  'ctrl-c':                        'chlorine:break-evaluation'  
  'ctrl-d':                        'chlorine:doc-for-var'
```

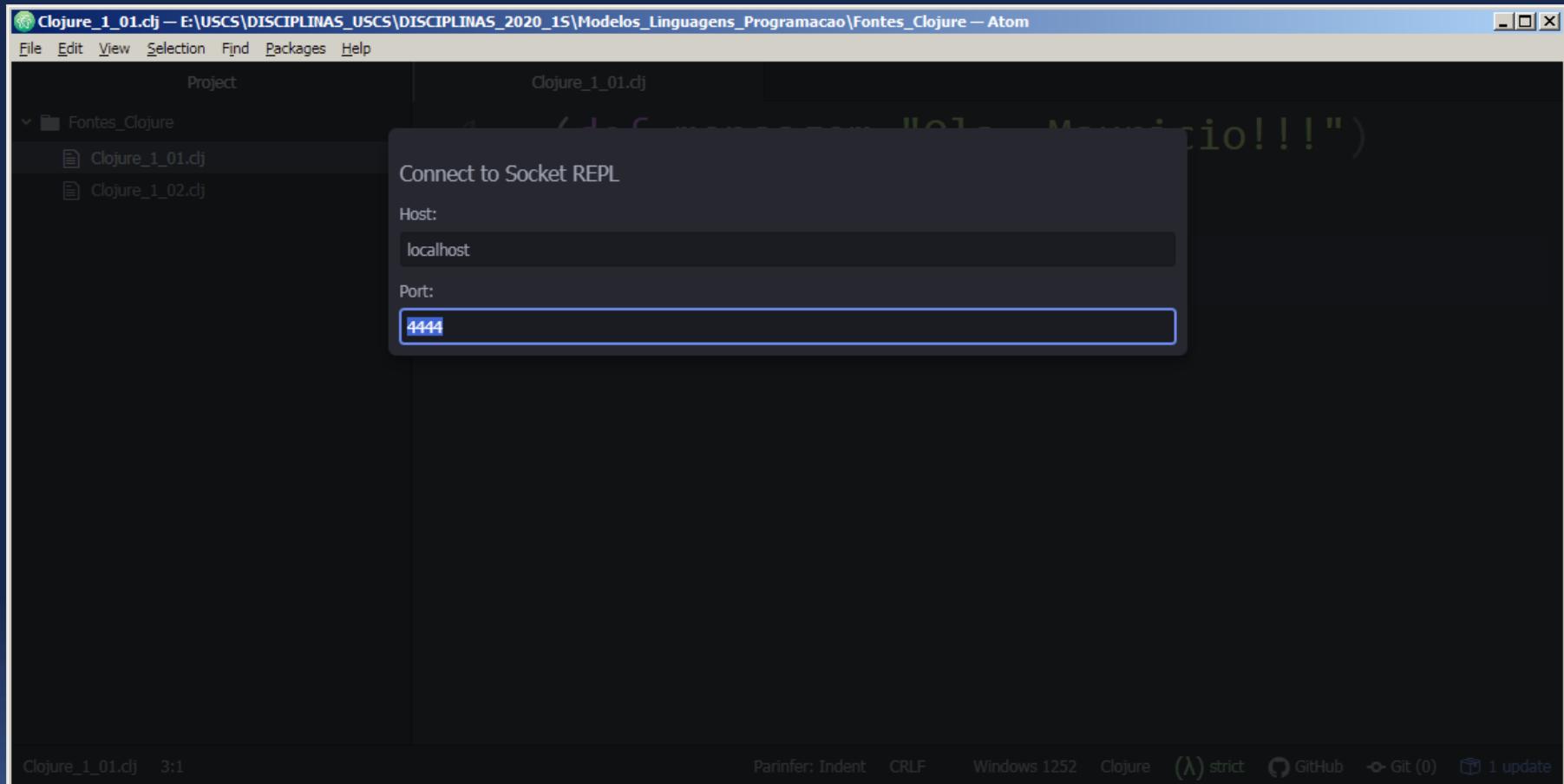
Atom – Package Chlorine

- ✓ Após instalação do Chlorine e subida do socket com REPL remoto
- ✓ **Ctrl + Shift + p** > **Connect Socket Repl**



Atom – Package Chlorine

- ✓ Informar Host e porta onde o REPL remoto está sendo executado



Atom – Package Chlorine

✓ REPL connected !!!

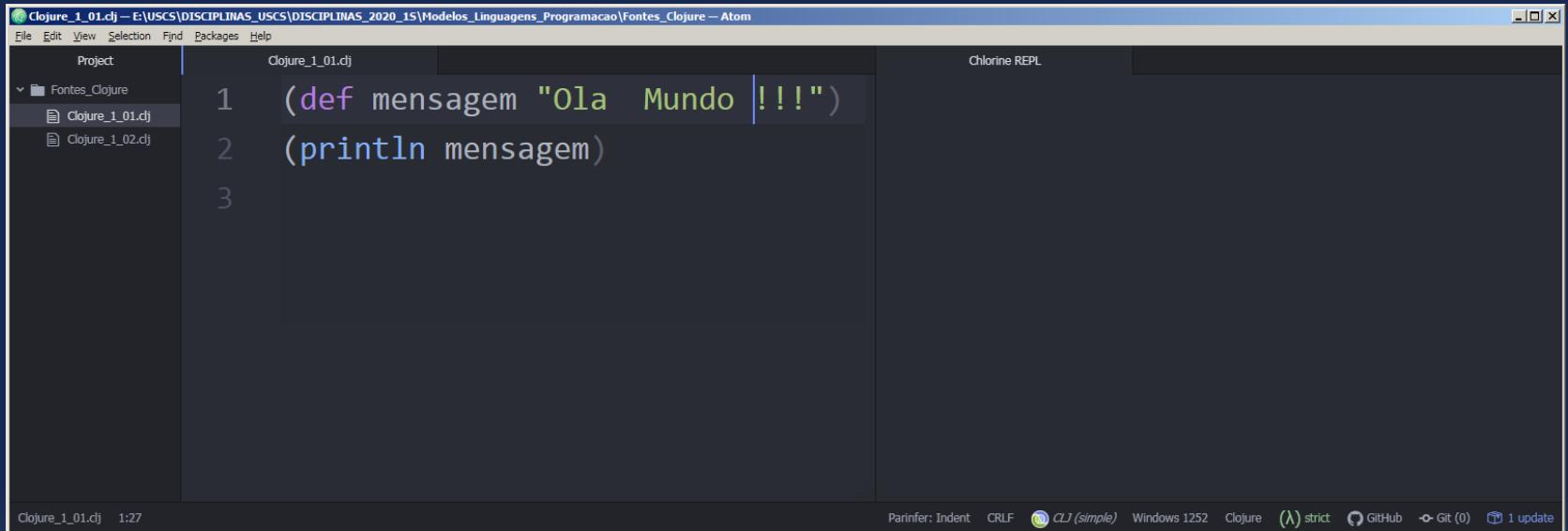
The screenshot shows the Atom code editor interface. In the top left, the file path is shown as "Clojure_1_01.clj – E:\USCS\DISCIPLINAS_USCS\DISCIPLINAS_2020_1S\Modelos_Linguagens_Programacao\Fontes_Clojure – Atom". The menu bar includes File, Edit, View, Selection, Find, Packages, and Help. The window title is "Clojure_1_01.clj". The left sidebar is labeled "Project" and lists "Fontes_Clojure" with files "Clojure_1_01.clj" and "Clojure_1_02.clj". The main editor area contains the following Clojure code:

```
1 (def mensagem "Olá")
2 (println mensagem)
3
```

A yellow warning dialog box titled "Chlorine REPL" is open, stating "REPL already connected" with an exclamation mark icon. It contains the text "REPL is already connected. Please, disconnect the current REPL if you want to connect to another." The status bar at the bottom shows "Clojure_1_01.clj 3:1", "Parinfer: Indent CRLF", "CLJ (simple)", "Windows 1252", "Clojure", "(λ) strict", "GitHub", "Git (0)", and "1 update".

Atom – Package Chlorine

✓ Escrever código **Clojure** (extensão .clj)



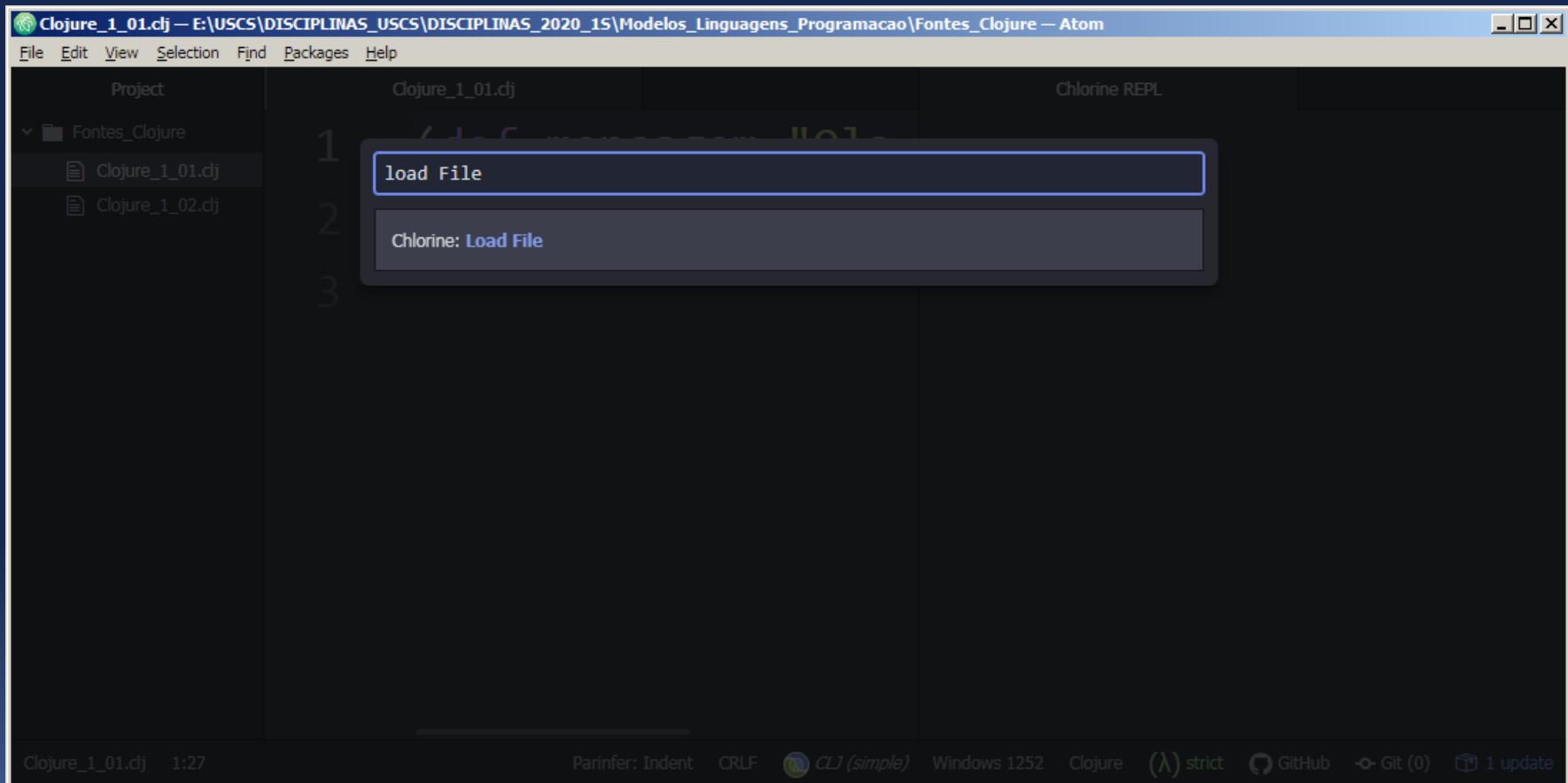
The screenshot shows the Atom code editor interface. The title bar reads "Clojure_1_01.clj – E:\USCS\DISCIPLINAS_USCS\DISCIPLINAS_2020_15\Modelos_Linguagens_Programacao\Fontes_Clojure – Atom". The menu bar includes File, Edit, View, Selection, Find, Packages, and Help. The left sidebar shows a "Project" tree with "Fontes_Clojure" expanded, containing files "Clojure_1_01.clj" (selected) and "Clojure_1_02.clj". The main editor area displays the following Clojure code:

```
1 (def mensagem "Olá Mundo !!!")
2 (println mensagem)
3
```

The status bar at the bottom shows "Clojure_1_01.clj 1:27" and various tool icons including Parinfer, CLJ (simple), GitHub, and Git.

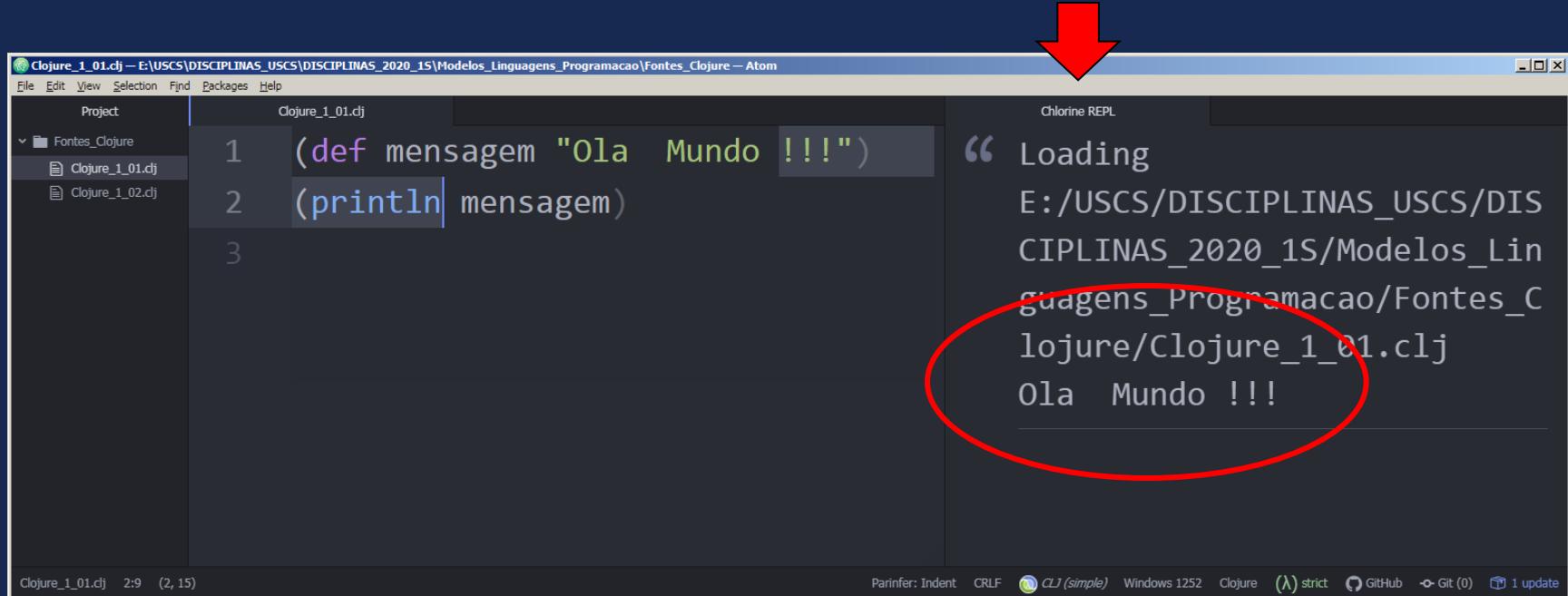
Atom – Package Chlorine

- ✓ Carregar código para Repl remoto
- ✓ **Ctrl + Shift + p > load File**



Atom – Package Chlorine

- ✓ Carga do código Clojure para o REPL



The screenshot shows the Atom code editor interface. On the left, there's a sidebar labeled "Project" with a tree view containing "Fontes_Clojure", "Clojure_1_01.clj" (which is selected), and "Clojure_1_02.clj". The main editor area has a dark theme and displays the following Clojure code:

```
1 (def mensagem "Olá Mundo !!!")
2 (println mensagem)
3
```

To the right is the "Chlorine REPL" panel, which shows the output of the code execution. A red arrow points from the top towards the status bar at the bottom. A red circle highlights the output text in the REPL panel:

```
“ Loading
E:/USCS/DISCIPLINAS_USCS/DISCIPLINAS_2020_1S/Modelos_Linguagens_Programacao/Fontes_Clojure/Clojure_1_01.clj
Olá Mundo !!!
```

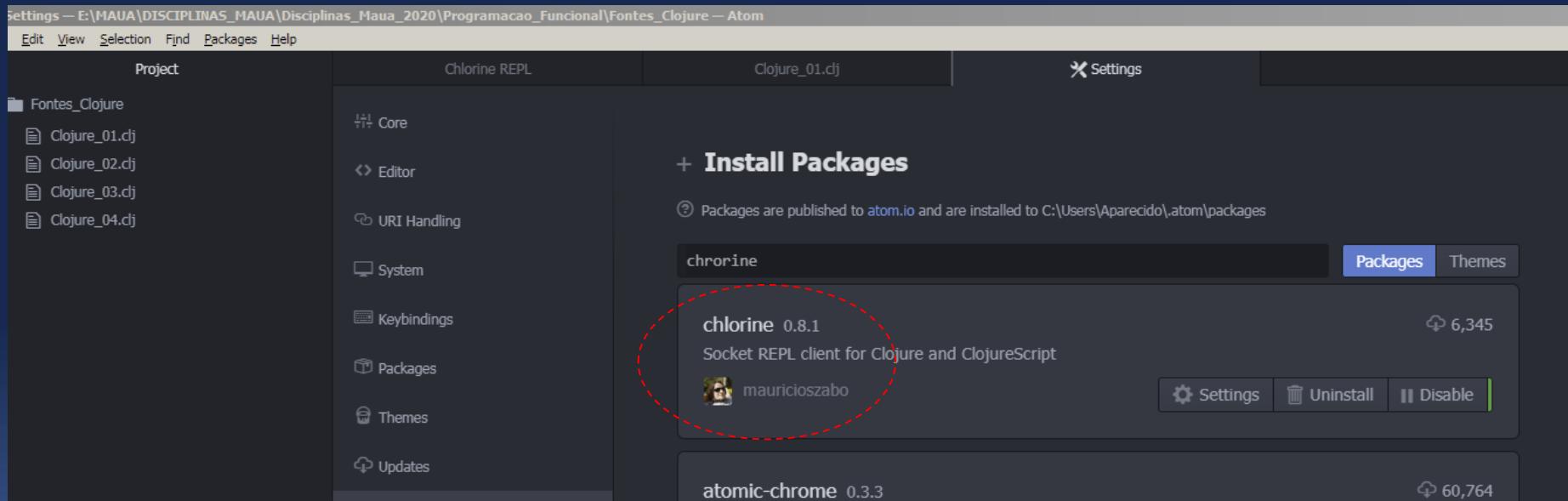
At the bottom of the screen, the status bar includes the file name "Clojure_1_01.clj", line number "2:9", character position "(2, 15)", and various status indicators like "Parinfer: Indent", "CRLF", "CLJ (simple)", "Windows 1252", "Clojure", "strict", "GitHub", "Git (0)", and "1 update".

Atom – Package Chlorine + nREPL (Leiningen)



Configuração do Package Chlorine no Atom

- ✓ Instalação do Package *Chroline* no Atom
- ✓ No menu do Atom: Packages > Settings View > Install Packages / Themes



Configuração do Package Chlorine no Atom

<https://mauricio.szabo.link/blog/2019/09/29/my-atom-editor-configuration-for-working-with-clojure-script-revisited/>

The screenshot shows a web browser window with the URL mauricio.szabo.link/blog/2019/09/29/my-atom-editor-configuration-for-working-with-clojure-script-revisited/. The page title is "My Atom editor configuration for working with Clojure/Script, revisited". The author is Maurício Szabo, and it was published on 2019-09-29. The main content discusses the use of two packages, `lisp-paredit` and `chlorine`, for Clojure development in Atom. It mentions issues with `lisp-paredit` and how `chlorine` provides better functionality like autocomplete and parenthesis inference. The sidebar includes a search bar, categories (with a dropdown menu showing "Select Category"), and tags (including "agile", "android", "arte", "atom", "Banco de Dados").

Sometime ago, I did a post on how I work with Atom to develop Clojure and ClojureScript projects. It is in Portuguese, so I'm gonna re-visit the subject and also update with my current workflow.

There are two packages that I *have to install* to work with Clojure: `lisp-paredit` and `chlorine`. Without `lisp-paredit`, when I start a newline, the indentation gets all sorts of problematic. I use it on "strict mode" and use the tools to slurp/barf forward only. As for `chlorine`, it is needed to have autocomplete, evaluation, show documentation, goto var definition and so on. Last, I use also `parinfer` so I can remove whole lines of text and `parinfer` will infer the correct closing of parenthesis for me (most of the time at least).

Categories

Select Category

Tags

ActiveRecord advent of parens

agile android arte atom Banco de Dados



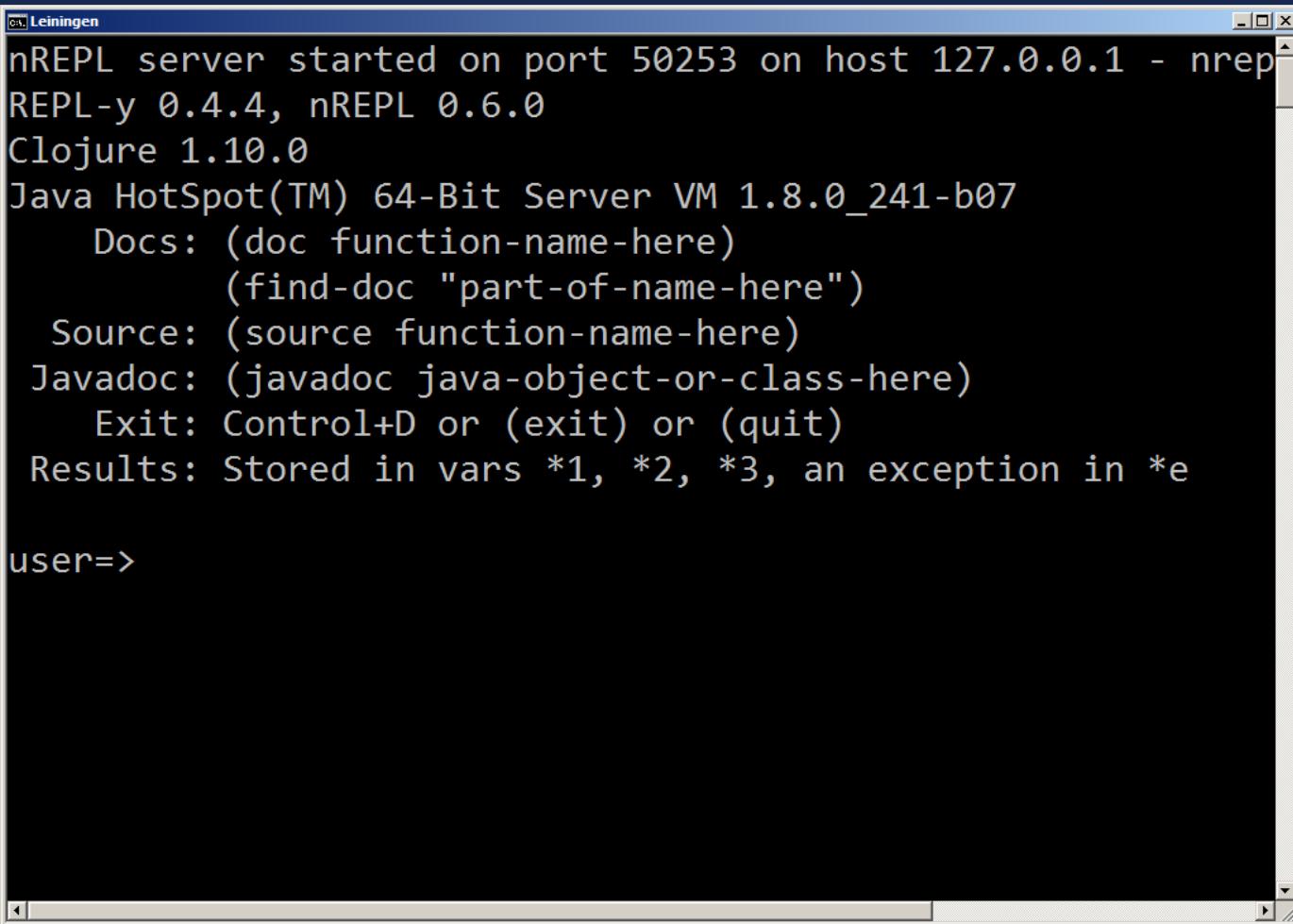
Configuração do Package Chlorine no Atom

- ✓ Sob Atom, teclar **Ctrl + Shift + p** e procurar “Open your keymap”;
- ✓ Após abertura do arquivo para customizar **keys**, incluir:

```
'atom-text-editor':  
  'ctrl-k':    'chlorine:clear-console'  
  'ctrl-shift-l':    'chlorine:load-file'  
  'ctrl-shift-enter':    'chlorine:evaluate-block'  
  'ctrl-enter':    'chlorine:evaluate-top-block'  
  'ctrl-c':    'chlorine:break-evaluation'  
  'ctrl-d':    'chlorine:doc-for-var'
```

Ativar nREPL - Leiningen

- ✓ Anotar a porta de comunicação, por exemplo: **50253**

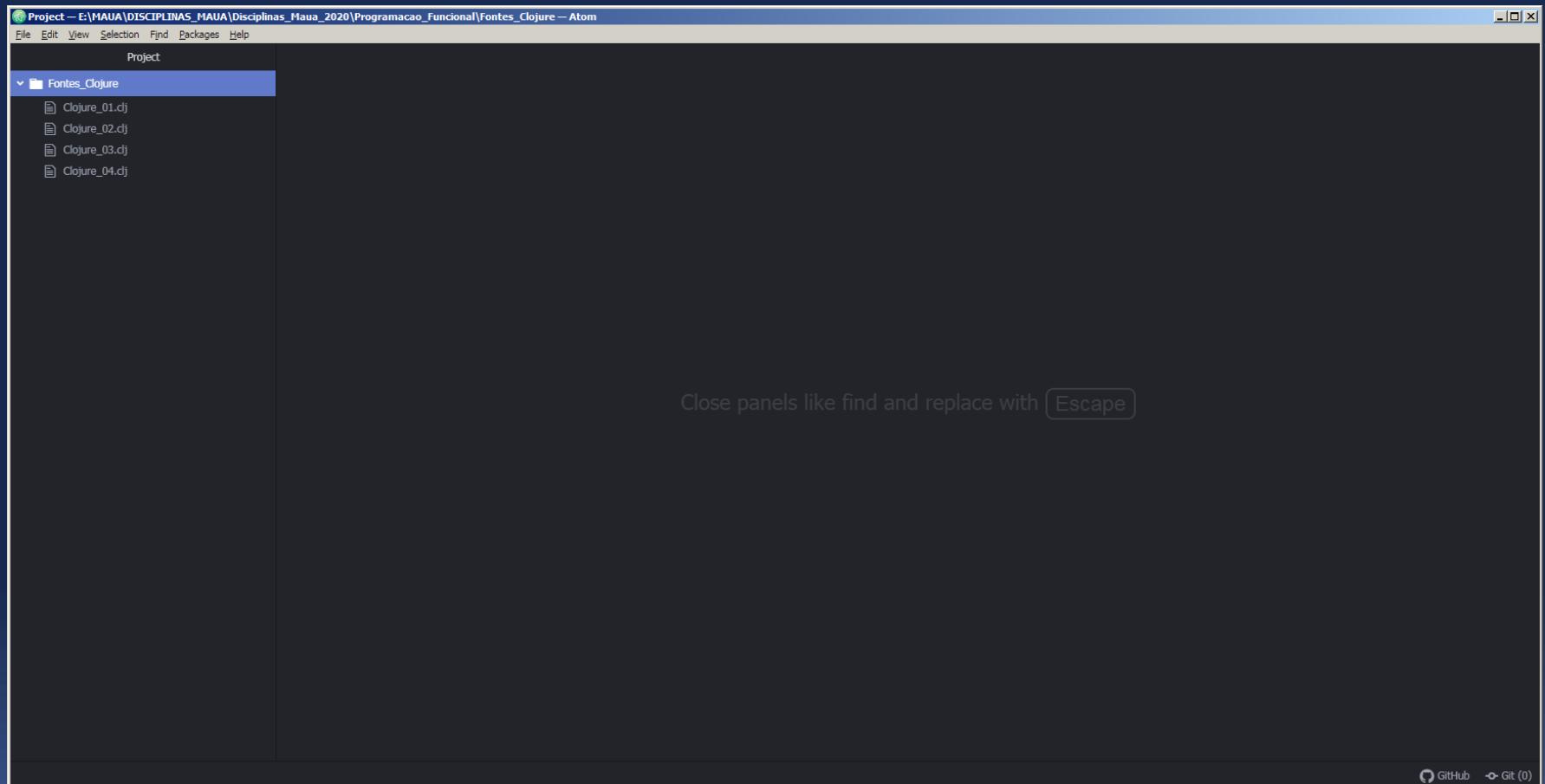


```
nREPL server started on port 50253 on host 127.0.0.1 - nrepl
REPL-y 0.4.4, nREPL 0.6.0
Clojure 1.10.0
Java HotSpot(TM) 64-Bit Server VM 1.8.0_241-b07
Docs: (doc function-name-here)
      (find-doc "part-of-name-here")
Source: (source function-name-here)
Javadoc: (javadoc java-object-or-class-here)
Exit: Control+D or (exit) or (quit)
Results: Stored in vars *1, *2, *3, an exception in *e

user=>
```

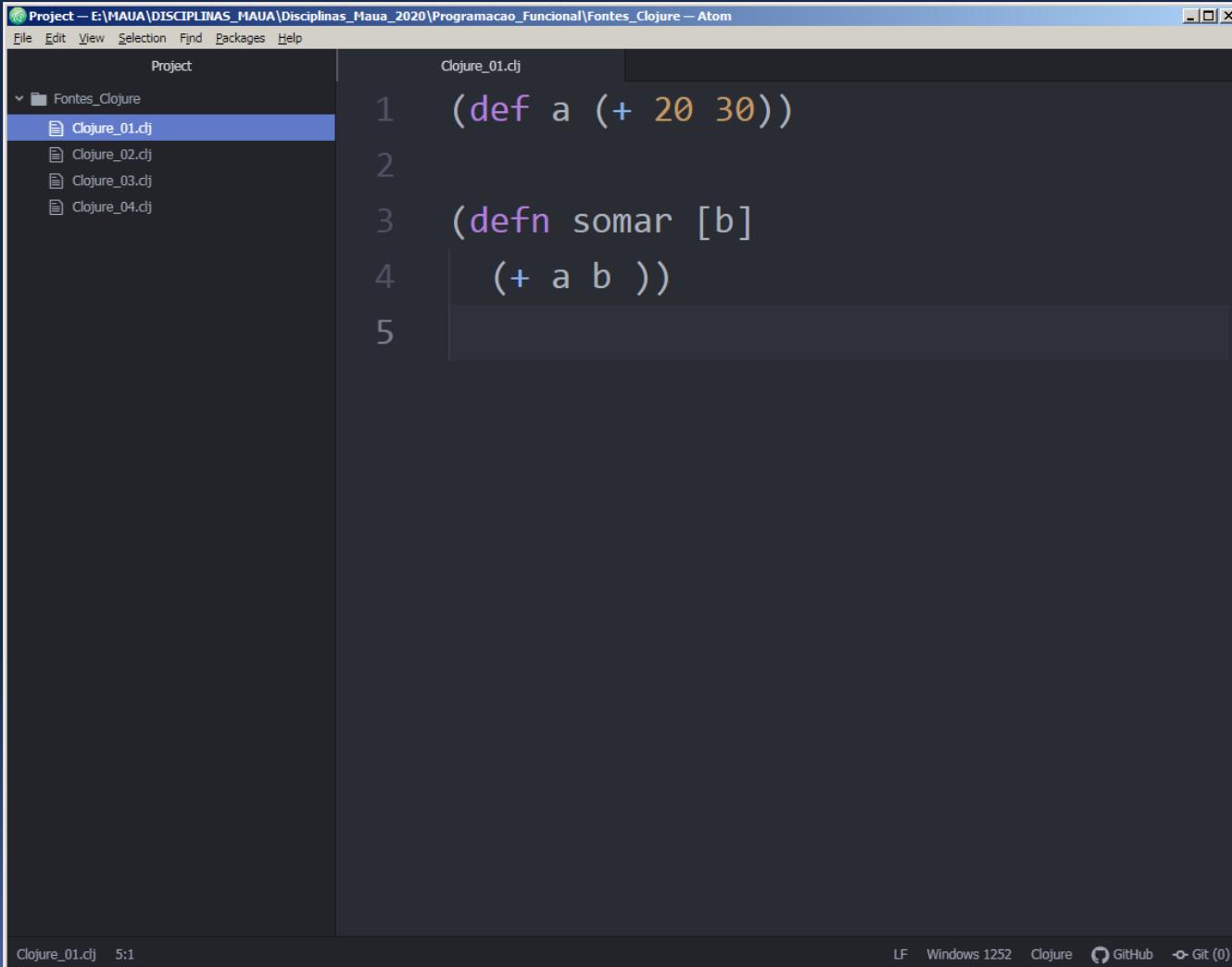
Ativar Atom

✓ File > Open Folder



Ativar Atom

- ✓ Escrevendo código Clojure no Atom



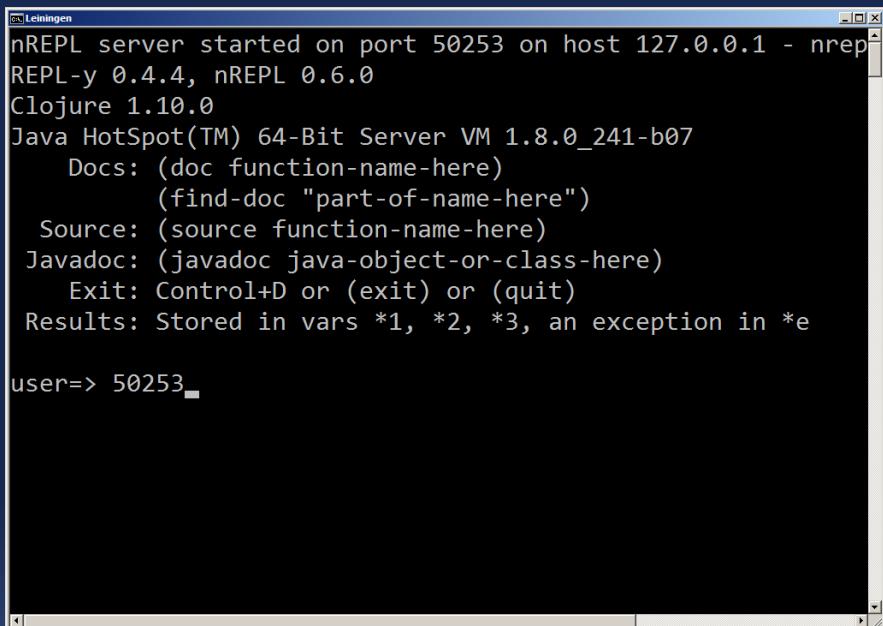
The screenshot shows the Atom code editor interface. The title bar reads "Project - E:\MAUA\DISCIPLINAS_MAU\Disciplinas_Maua_2020\Programacao_Funcional\Fontes_Clojure - Atom". The menu bar includes File, Edit, View, Selection, Find, Packages, and Help. The left sidebar is titled "Project" and shows a folder structure under "Fontes_Clojure": "Clojure_01.clj" (selected), "Clojure_02.clj", "Clojure_03.clj", and "Clojure_04.clj". The main editor area displays the following Clojure code:

```
1 (def a (+ 20 30))
2
3 (defn somar [b]
4   (+ a b ))
```

The status bar at the bottom shows "Clojure_01.clj 5:1" and icons for LF, Windows 1252, Clojure, GitHub, and Git (0).

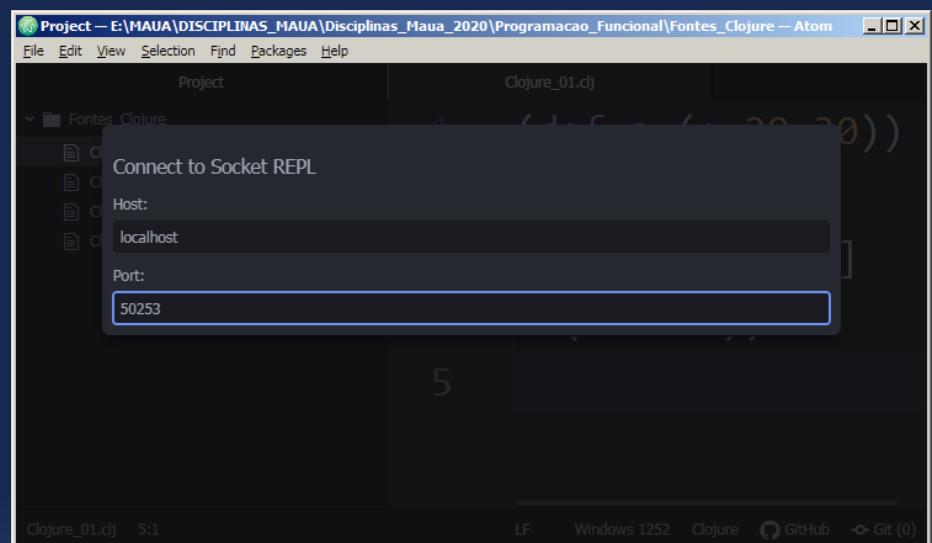
Ativar Atom

- ✓ Ativando **nREPL** (Leiningen)
- ✓ **Ctrl + Shift + p** > Connect to Socket REPL
 - > Host: **localhost**
 - > Port: aquela fornecida pela nREPL (Leiningen), por exemplo: **50253**



```
Leiningen
nREPL server started on port 50253 on host 127.0.0.1 - nrepl
REPL-y 0.4.4, nREPL 0.6.0
Clojure 1.10.0
Java HotSpot(TM) 64-Bit Server VM 1.8.0_241-b07
  Docs: (doc function-name-here)
         (find-doc "part-of-name-here")
  Source: (source function-name-here)
Javadoc: (javadoc java-object-or-class-here)
  Exit: Control+D or (exit) or (quit)
Results: Stored in vars *1, *2, *3, an exception in *e

user=> 50253
```



Clojure nREPL Connected

The screenshot shows a Clojure development environment with the title bar "Clojure_01.clj — E:\MAUA\DISCIPLINAS_MAU\Disciplinas_Maua_2020\Programacao_Funcional\Fontes_Clojure — A...".

The interface has three main panes:

- Project:** Shows a file tree under "Fontes_Clojure" with files: Clojure_01.clj, Clojure_02.clj, Clojure_03.clj, and Clojure_04.clj. "Clojure_01.clj" is selected.
- Clojure_01.clj:** Displays the code:

```
2
3 (defn
4   (+ a
5
```

A tooltip "Clojure nREPL Connected" is visible above the code area.
- Chlorine REPL:** Displays the output of the nREPL session:

```
2
3 (defn
4   (+ a
5
```

At the bottom, the status bar shows "Clojure_01.clj 5:1", "LF", "CLJ (simple)", "Windows 1252", "Clojure", "GitHub", and "Git (0)".

Carregando Código para nREPL

✓ Ctrl + Shift + p > Chroline: Load File



The screenshot shows the Atom code editor interface. On the left, the project structure includes files like Clojure_01.clj, Clojure_02.clj, Clojure_03.clj, and Clojure_04.clj. The main editor area displays the following Clojure code:

```
(def a (+ 20 30))
(defn somar [b]
  (+ a b))
```

To the right, the "Chroline REPL" panel shows the output of the command. It starts with the message "Loading" followed by the path to the file: "E:/MAUA/DISCIPLINAS_MAUΑ/Disciplinas_Maua_2020/Programacao_Funcional/Fontes_Clojure/Clojure_01.clj". A blue tooltip box highlights the path "E:/MAUA/DISCIPLINAS_MAUΑ/Disciplinas_Maua_2020/Programacao_Funcional/Fontes_Clojure/Clojure_01.clj". The status bar at the bottom of the screen shows "LF CLJ (simple) Windows 1252 Clojure GitHub Git (0)".

Evaluate "top-blocks"

- ✓ Hot Key: **Ctrl + Enter**
- ✓ Selecionar o top block desejado e teclar => **Ctrl + Enter**

```
(def a (+ 20 30))
(defn somar [b]
  (+ a b))
(somar 5)
```

Evaluate "top-blocks"

- ✓ Por exemplo, marcar o top block (somar 5) e teclar => **Ctrl + Enter**

The screenshot shows the Atom code editor interface. On the left, the project structure shows files like Clojure_01.clj, Clojure_02.clj, Clojure_03.clj, and Clojure_04.clj. The main editor pane displays Clojure code:

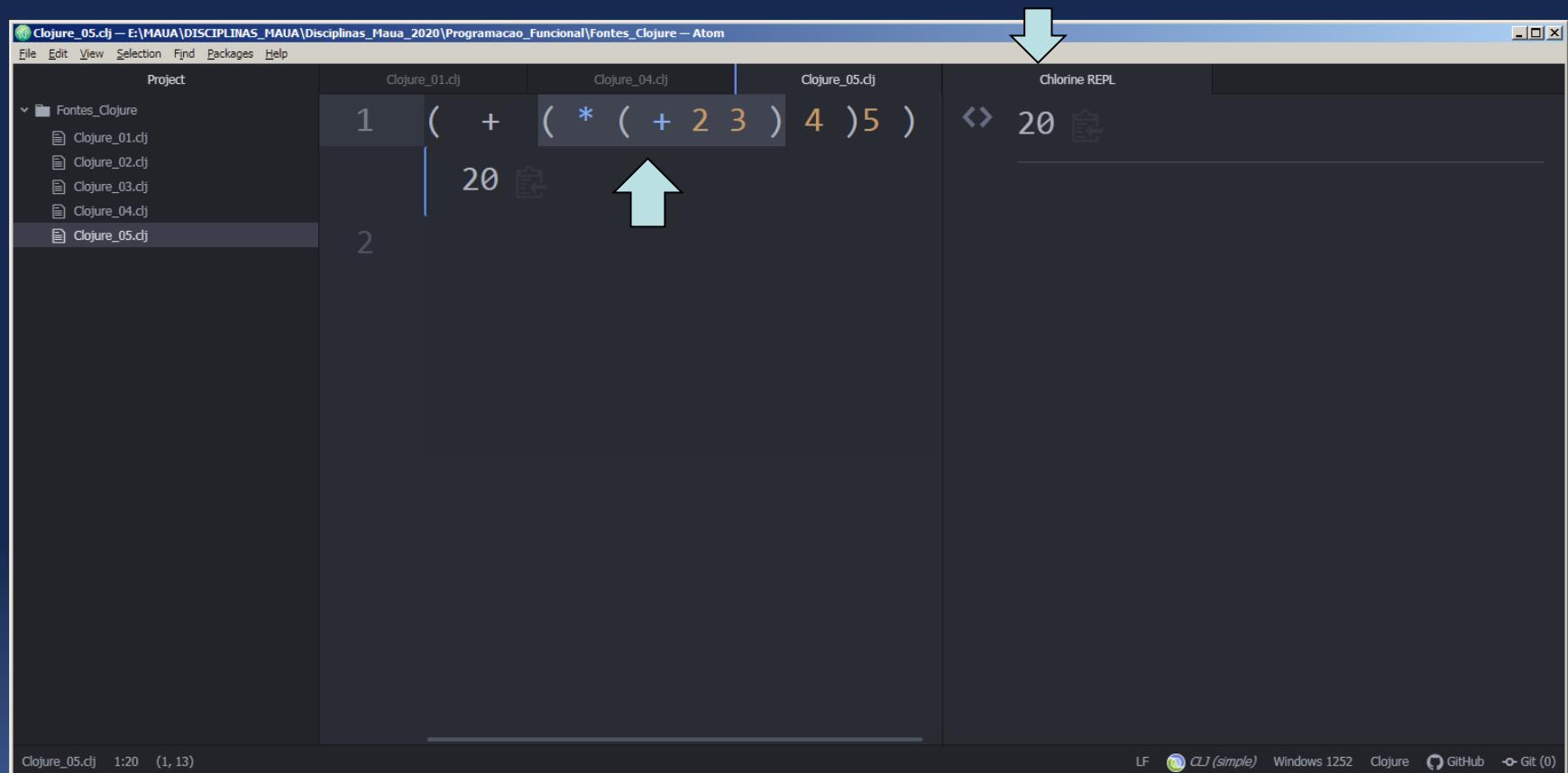
```
1 (def a (+ 20 30))
2
3 (defn somar [b]
4   (+ a b ))
5
6 (somar 5)
7
```

A light blue arrow points from the line '(somar 5)' in the editor to the same line in the 'Chlorine REPL' pane on the right, which shows the result '55'. The 'Chlorine REPL' pane also has a small icon of a clipboard.

At the bottom of the Atom window, status icons include LF, CLJ (simple), Windows 1252, Clojure, GitHub, and Git (0).

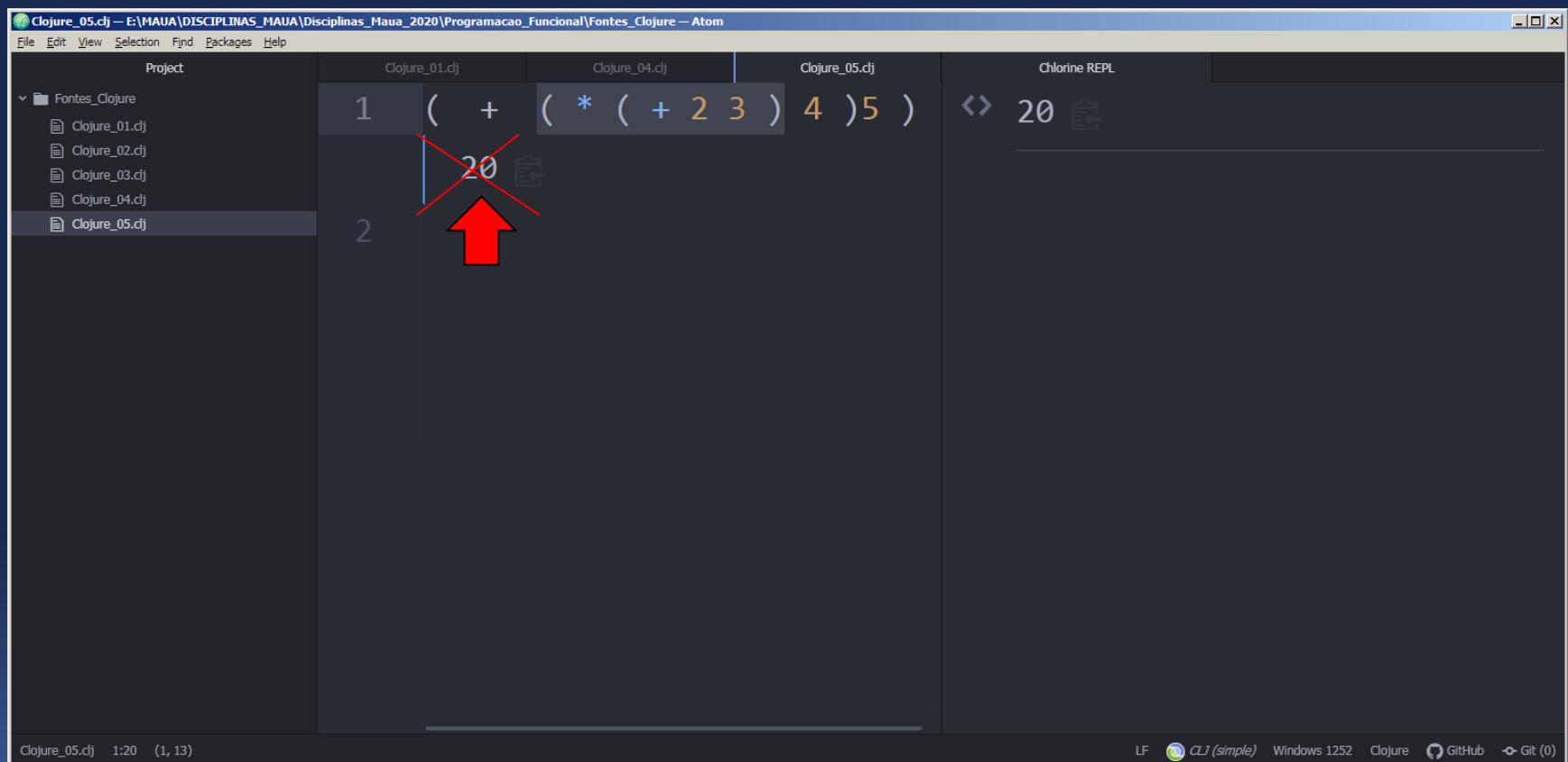
Evaluate "blocks"

- ✓ Hot Key: **Ctrl + Shift + Enter**
- ✓ Selecionar o block desejado e teclar => **Ctrl + Shift + Enter**



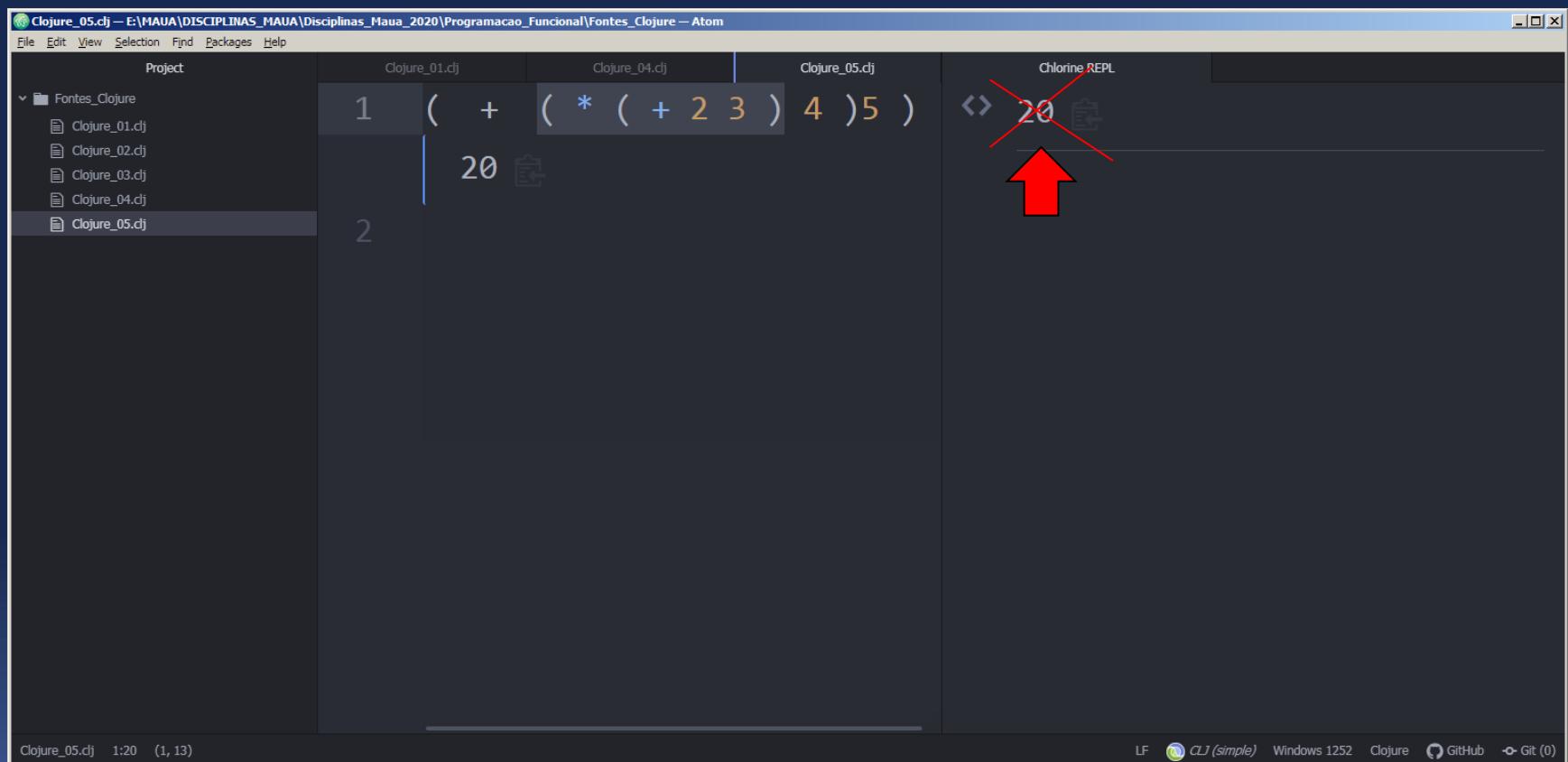
Clear Inline Results

- ✓ Pode também ser feito pela hot key: **Ctrl + Shift + L**



Clear Console

✓ Pode ser feito pela hot key: **Ctrl +k**



The screenshot shows the Atom code editor interface with several tabs open: Clojure_01.clj, Clojure_04.clj, and Clojure_05.clj. The Clojure_05.clj tab is active, displaying the following code:

```
1 ( ( + ( * ( + 2 3 ) 4 ) 5 )
2 20
```

In the bottom right corner of the editor window, there is a terminal panel titled "Chlorine REPL". The terminal shows the output of the code execution. A large red arrow points from the text "Pode ser feito pela hot key: Ctrl +k" at the top of the slide down to the "clear" icon in the terminal's toolbar.

Clear console

- ✓ $\text{Ctrl} + \text{Shift} + \text{p} > \text{Chroline: Clear Inline Results}$

