

Course Introduction

Computational Physics

Course Introduction

Outline

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Course Description

- Introduction to computational methods for simulating physical systems and solving problems.
- Sophomore Level
- No previous experience with computational methods
- "Lab Course"

Course Description

The Learning Curve

- We need to learn many new things...
 - Dealing with Lab Computers
 - Unix operating system
 - X Windows System
 - Text Editors for X Windows
 - Report Writing (e.g. with Open Office)
 - Using Computer Language: MATLAB
 - MATLAB's user interface
 - Arrays
 - Interactive, Scripts, Functions
 - Plotting

Course Description

The Learning Curve

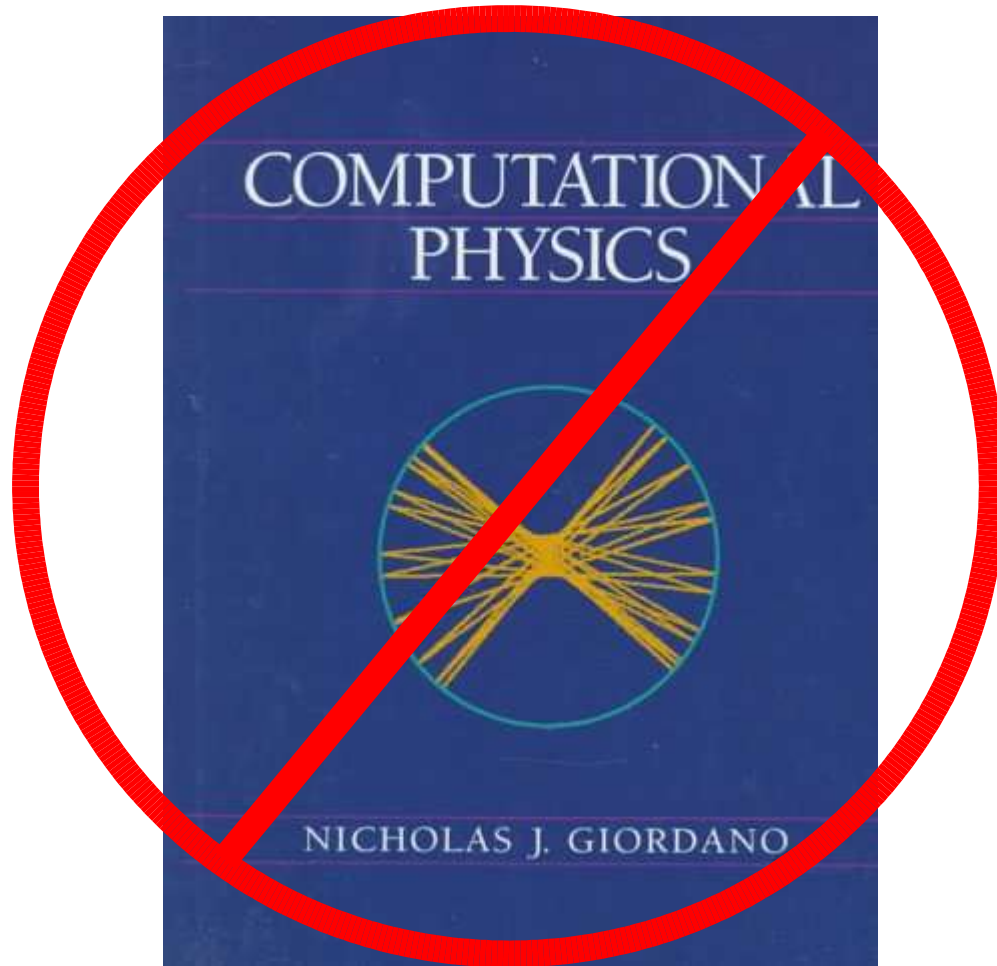
- Once we learn these things we will learn to:
 - Solve Ordinary Differential Equations
 - Solve Partial Differential Equations
 - Monte Carlo Simulation of Physical Systems
- Examples of Physics ...
 - Motion of projectiles with air resistance
 - Motion of pendulum and Chaos
 - Orbits in the Solar System
 - Diffusion

Course Information

Instructors

- Pete Schloerb (Instructor)
 - 630 LGRT-B - 545 4303
 - Email: *schloerb @ astro.umass.edu*
- Teaching Assistant: Yuxi Chen
 - 619f LGRT-B – 545 3857
 - Email: *yxchen @ astro.umass.edu*
- Computer Lab Supervisor: D. Popowich
 - 528 LGRT-B – 577 0470
 - Report Problems to:
rt @ cs.astro.umass.edu

Textbook



NO Official Textbook this Year

Course Information

Web Pages

www.astro.umass.edu/~schloerb/ph281

What do we do?

- Exercises (every class)
 - Short problems; practice
- Projects (every few weeks)
 - Calculation of a real Physics Problem
 - Explore behavior
 - Submit Lab Report
- Final Problem

A Word to the Wise

- Attend Class
 - There is not always a lecture, but we often review matters that have been troubling
 - Instructors are here to help
- Don't fall behind
 - Exercises and Projects take longer than you think.
- Learn Matlab!
 - Spend some time with tutorials and manual.

Course Information

Tentative Schedule

- Lab Computers
- Matlab
- Interpolation; Numerical Integration
- Random Numbers and Simulation
- Ordinary Differential Equations
- Partial Differential Equations

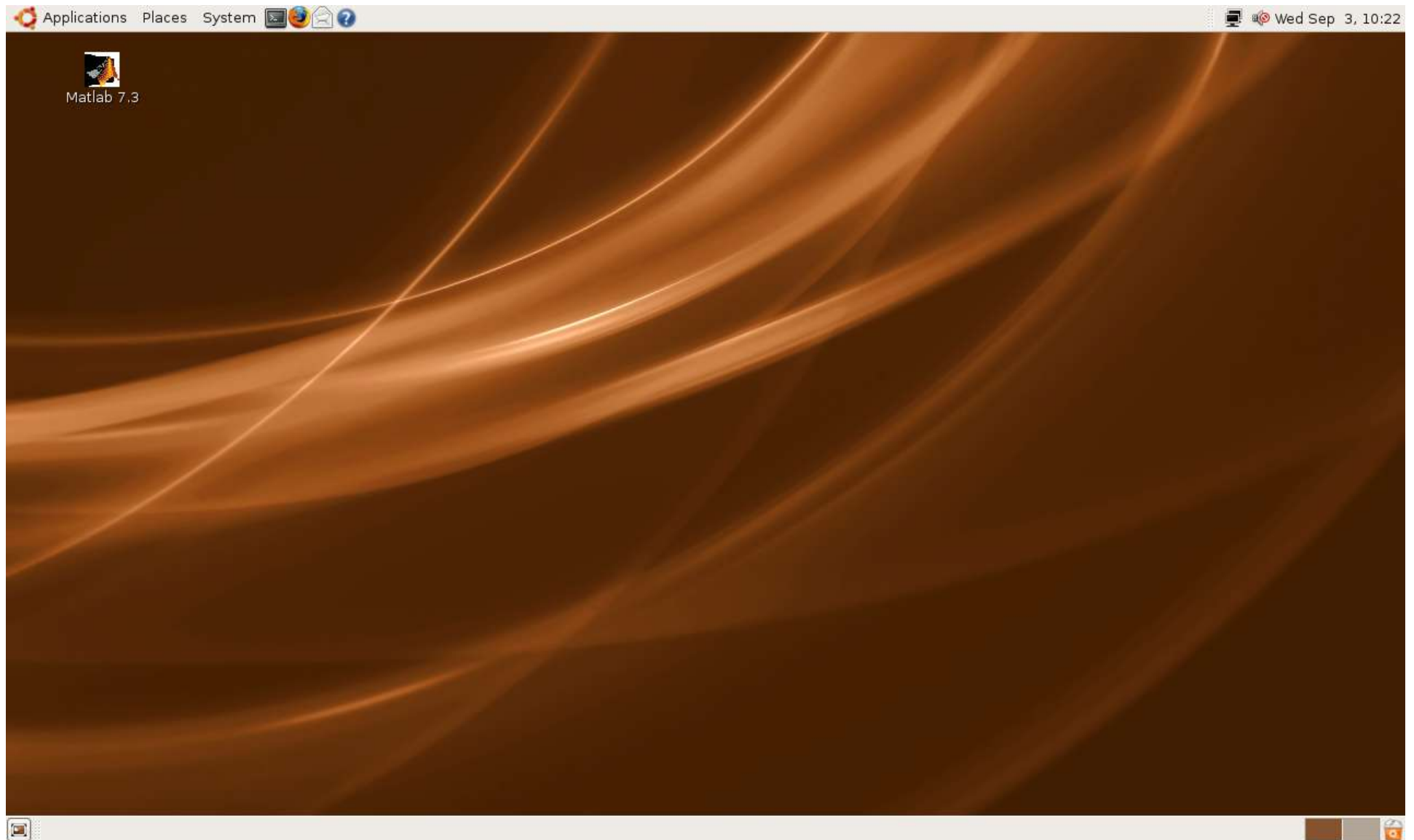
Computer Classroom Guidelines

- Report technical problems to Computing Staff: *rt@cs.astro.umass.edu*
- Don't switch computers off and on to clear problems ... doing this can ruin the file systems.
- Please: No Food or Drink in classroom.
- Printer is for postscript files, not plain text. To print a text file you must use *enscript*
 - example: *enscript my_file.txt*
- Turn off terminal when you leave (save energy!)
- *Please be sure door is locked when you leave!*

Getting Started with Computers

- Login Procedure
 - Login with your assigned username
 - Enter your assigned password
 - DO NOT CHANGE YOUR PASSWORD
- Logout Procedure
 - Click mouse on "System" on menubar at top of screen
 - Select "Quit"
 - Select "Logout" when dialog box appears.

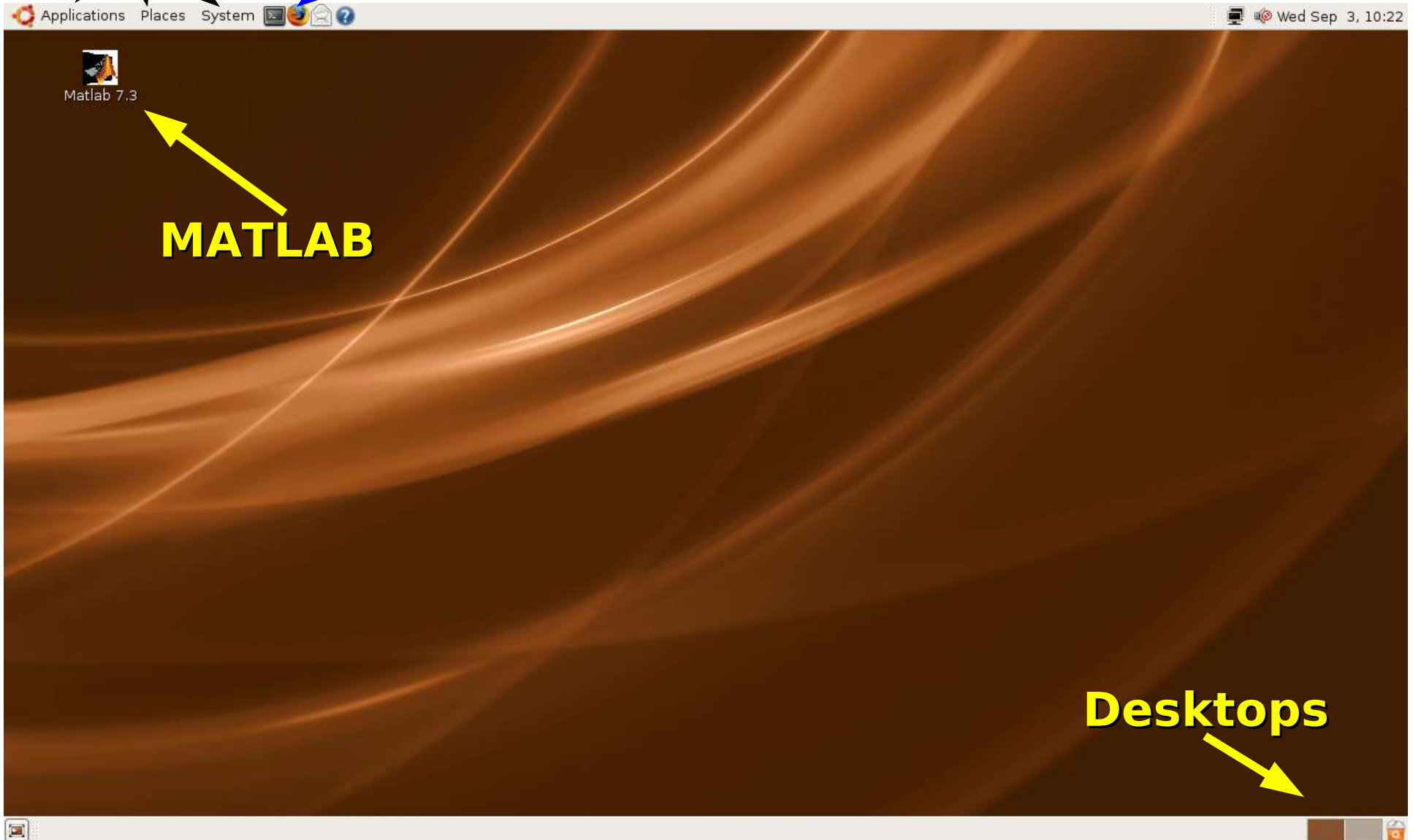
Desktop



Web Browser (Firefox)

<http://www.astro.umass.edu/~schloerb/ph281>

Menus



MATLAB

The image shows the MATLAB 7.3.0 (R2006b) software interface. The window title is "MATLAB 7.3.0 (R2006b)". The menu bar includes File, Edit, View, Graphics, Debug, Desktop, Window, and Help. The current directory is "/home/schloerb".

The Workspace window displays the following table:

Name	Value	Min	Max
a	<1x11 double>	0	10
b	<1x11 double>	0	100

The Command Window shows the following text:

```
< M A T L A B >  
Copyright 1984-2006 The MathWorks, Inc.  
Version 7.3.0.298 (R2006b)  
006  
  
To get started, select MATLAB Help or Demos from the Help menu.  
  
>> a = 0:10  
a =  
    0    1    2    3    4    5    6    7    8    9   10  
  
>> b = 10*a  
b =  
    0   10   20   30   40   50   60   70   80   90  100  
  
>>
```

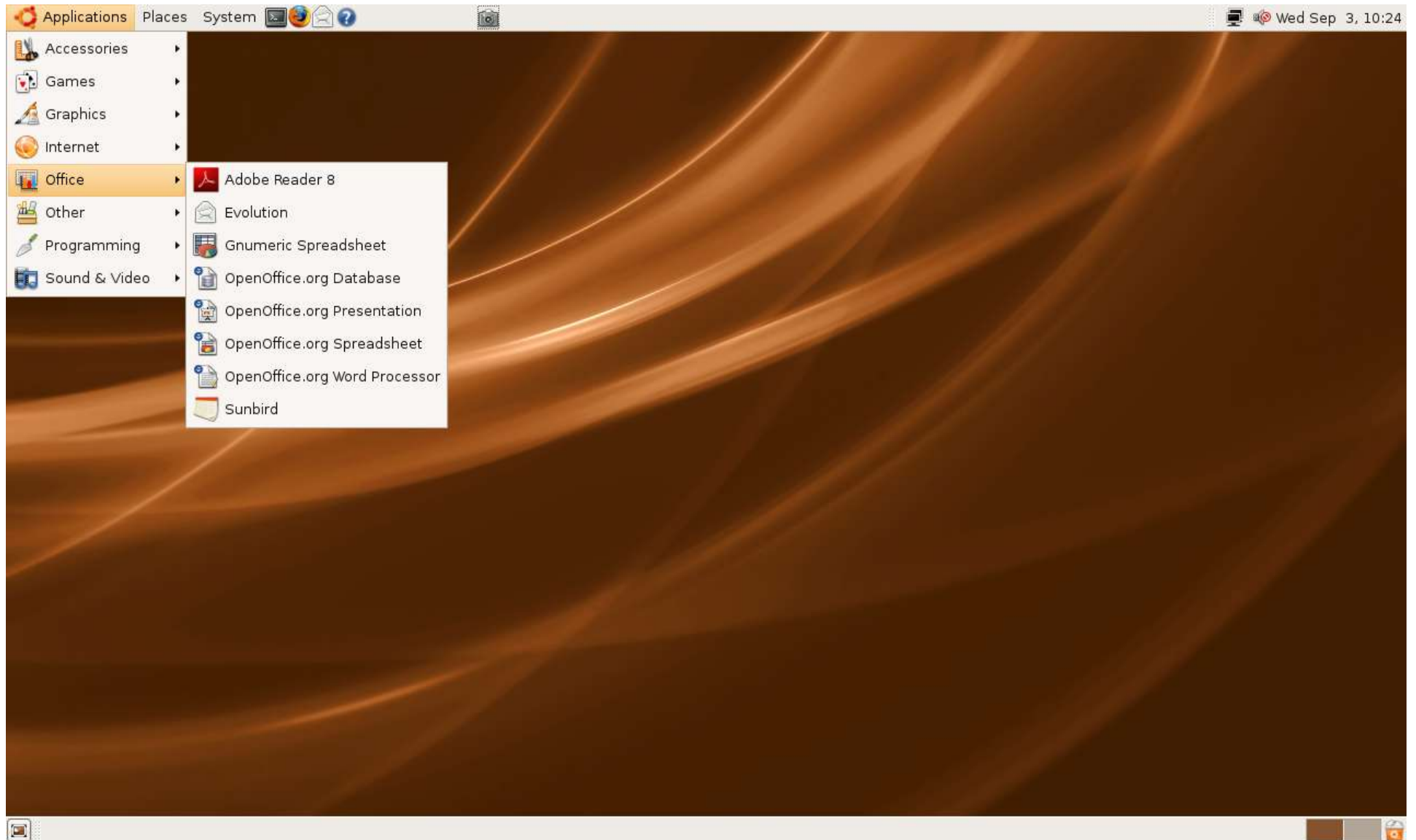
Exit MATLAB

The screenshot shows the MATLAB 7.3.0 (R2006b) interface. The 'File' menu is open, and the 'Exit MATLAB' option is highlighted with a red circle. A red arrow points from the text 'Select: Exit MATLAB' to the highlighted option. The Command Window shows the execution of a script named 'fall.m', which calculates the height of an object over time. The current directory is set to '/home/schloerb/Mystuff/ph281/'.

**Select:
Exit MATLAB**

```
>> cd Mystuff/ph281/  
>> fall  
Enter initial height (m): 500  
Here are results:  
t          x  
----  
0.0      500.00  
1.0      495.10  
2.0      480.40  
3.0      455.90  
4.0      421.60  
5.0      377.50  
6.0      323.60  
7.0      259.90  
8.0      186.40  
9.0      103.10  
10.0     10.00  
Enter initial height (m): 500  
Here are results:  
t          x  
----  
0.0      500.00  
1.0      495.10  
2.0      480.40  
3.0      455.90  
4.0      421.60  
5.0      377.50  
6.0      323.60  
7.0      259.90  
8.0      186.40  
9.0      103.10  
10.0     10.00  
>>
```

OpenOffice



Logging Out

