

Cosc 2P12

Assignment 5

Due date: Monday December 12th 23:59

Late date Thursday December 15th 23:59

Goal

The goal of this assignment is to introduce Floating Point operations in MIPS.

Background

Newton devised a method to approximate a root of an equation by repeatedly apply the formula until the error was sufficiently small. This formula, also known as the Newton–Raphson method, is defined as:

$$x_{n+1} = x_n - (F(x_n)/F'(x_n))$$

Consider a continuous function $F(x)=x^3-4x^2+1$ with its derivative $F'(x)=3x^2-8x$. Thus, by calculating successive values of x , the value of $F(x_n)$ will approach 0, and hence be a root of F .

The Assignment

Write a MIPS program which will find a value of x_n such that $F(x_n)=0$, to a tolerance of 10^{-6} .

Prompt the user to enter an initial integer value for x , hence x_1 . Then calculate each new x value, using the formula above, until $F(x)$ is sufficiently close to 0. Try the value of 2 as a test input value.

All calculations **must** be done as doubles. Your program should output x and the value of $F(x)$ at each step and finally print the root (x) that you found. You should try other values for the initial value of x to test your program.

Note, your output will not be so clean since the default print of a double includes many decimal places and could be in scientific notation, don't worry about aligning the output.

The output with an input of 2 should look like the following:

Please enter an integer: 2

$x=2.0$, $F(x)=-7.0$

$x=0.25$, $F(x)=0.765625$

$x=0.6724137931034483$, $F(x)=-0.5045358563286728$

$x=0.5469975054591968$, $F(x)=-0.033160000071302154$

$x=0.5374642805088174$, $F(x)=-2.1525861187732254E-4$

$x=0.5374015797596746$, $F(x)=-9.386846855363729E-9$

$x=0.5374015797596746$

Submission

This assignment must be submitted electronically using Sakai by the date above (note all times are in EST). Include the MIPS assembly file and a text file of the test output.

The TA will be running your program to ensure it is fully functional. Make the marker happy!!!

For the electronic submission for Sakai, please double check that you included:

- MIPS .asm file.
- Text file demonstrating your test output.

The End