Mfile name

test_mydiff.m

Contents

Revised:

October 2, 2007

Purpose

Testing the mydiff function to find the the first derivative of the function at x within a prespecified percentage tolerance tol and a starting step size of dx. The function uses forward divided difference method.

Usage

```
     fp=mydiff(f,x,dx,tol)
Input variables
     f = function
     x = point at which derivative of f is sought
     dx = starting step size
     tol = prespecified percentage tolerance
Output variables
     fp = approximate value of derivative of f at point x
```

```
% Keyword
%       Differentiation
%       Forward Divided Difference

% Author
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%       Section: All
%       Semester: Fall 2007

clc
disp('Name: Autar Kaw')
disp('Section: All')
```

```
Name: Autar Kaw
Section: All
```

Test 1

```
%Test#1 to see if the procedure works for prespecified tolerance being small
% For a tolerance of 0.000005%, find the derivative of 2*exp(1.5*x) at
% x=2.5 with a starting step size of 0.2.  We should get results close to
% the exact value
disp ('Test#1')

tol=0.000005;
fprintf ('\nTolerance = %g\n', tol)

y=2.5;
fprintf ('Value at which derivative is to be found = %g\n', y)

dy=0.2;
fprintf ('Starting value of step size=%g\n', dy)

g=inline('2*exp(1.5*x)');
fun_string=['Function of which derivative is found is  f=' char(g)];
fprintf(fun_string)

% Value obtained using my own differentiation routine
fpvalue=mydiff(g,y,dy,tol);
fprintf ('\n\nApproximate value of derivative= %g\n', fpvalue)
% Value obtained using exact differentiation of matlab
syms x;
f=2*exp(1.5*x);
fpexact=subs(diff(f,x),y);
fprintf ('Exact value of derivative= %g\n', fpexact)
disp('_____________________________________________________')
```

```
Test#1

Tolerance = 5e-006
Value at which derivative is to be found = 2.5
Starting value of step size=0.2
Function of which derivative is found is  f=2*exp(1.5*x)

Approximate value of derivative= 127.563
Exact value of derivative= 127.563
_____________________________________________________________
```

Test 2

```
%Test#2 to see if the procedure works for prespecified tolerance being small
% For a small tolerance of 0.5%, find the derivative of 2*exp(1.5*x) at
% x=2.5 with a starting step size of 0.2.
% We should get results NOT close to exact value.
disp ('Test#2')

tol=0.5;
fprintf ('\nTolerance = %g\n', tol)

y=2.5;
fprintf ('Value at which derivative is to be found = %g\n', y)

dy=0.2;
fprintf ('Starting value of step size=%g\n', dy)

g=inline('2*exp(1.5*x)');
fun_string=['Function of which derivative is found is  f=' char(g)];
fprintf(fun_string)

% Value obtained using my own differentiation routine
fpvalue=mydiff(g,y,dy,tol);
fprintf ('\n\nApproximate value of derivative= %g\n', fpvalue)
% Value obtained using exact differentiation of matlab
syms x;
f=2*exp(1.5*x);
fpexact=subs(diff(f,x),y);
fprintf ('Exact value of derivative= %g\n', fpexact)
disp('_____________________________________________________________')


Test#2

Tolerance = 0.5
Value at which derivative is to be found = 2.5
Starting value of step size=0.2
Function of which derivative is found is  f=2*exp(1.5*x)

Approximate value of derivative= 128.163
Exact value of derivative= 127.563
_____________________________________________________________
```

Published with MATLAB® 7.10