Solution 4.23

First, we must develop a function like the one in Example 4.8, but to evaluate a forward difference:

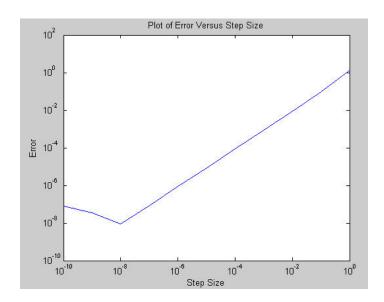
```
function prob0422(func,dfunc,x,n)
format long
dftrue=dfunc(x);
h=1;
H(1) = h;
D(1)=(func(x+h)-func(x))/h;
E(1) = abs(dftrue-D(1));
for i=2:n
  h=h/10;
  H(i)=h;
  D(i) = (func(x+h) - func(x))/h;
  E(i) = abs(dftrue-D(i));
end
L=[H' D' E']';
fprintf(' step size finite difference
                                              true error\n');
fprintf('%14.10f %16.14f %16.13f\n',L);
loglog(H,E),xlabel('Step Size'),ylabel('Error')
title('Plot of Error Versus Step Size')
format short
```

Solution continued on the next page...

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We can then use it to evaluate the same case as in Example 4.8:

```
>> ff=@(x) -0.1*x^4-0.15*x^3-0.5*x^2-0.25*x+1.2;
>> df=@(x) -0.4*x^3-0.45*x^2-x-0.25;
>> prob0422(ff,df,0.5,11)
   step size
               finite difference
                                    true error
 1.000000000 -2.23750000000000
                                  1.3250000000000
 0.100000000 -1.0036000000000
                                  0.0911000000000
 0.010000000 -0.92128509999999
                                  0.0087851000000
 0.0010000000 -0.91337535009994
                                  0.0008753500999
 0.0001000000 -0.91258750349987
                                  0.0000875034999
 0.0000100000 -0.91250875002835
                                  0.0000087500284
 0.0000010000 - 0.91250087497219
                                  0.0000008749722
 0.0000001000 -0.91250008660282
                                  0.0000000866028
 0.000000100 -0.91250000888721
                                  0.0000000088872
 0.000000010 -0.91249996447829
                                  0.000000355217
 0.0000000001 - 0.91250007550059
                                  0.0000000755006
```



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