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...

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

  1.0000000000 -2.23750000000000  1.32500000000000

  0.1000000000 -1.00360000000000  0.09110000000000

  0.0100000000 -0.92128509999999  0.00878510000000

  0.0010000000 -0.91337535009994  0.00087535009999

  0.0001000000 -0.91258750349987  0.00008750349999

  0.0000100000 -0.91250875002835  0.00000875002835

  0.0000010000 -0.91250087497219  0.00000087497219

  0.0000001000 -0.91250008660282  0.00000008660282

  0.0000000100 -0.91250000888721  0.00000000888721

  0.0000000010 -0.91249996447829  0.00000003552171

  0.0000000001 -0.91250007550059  0.00000007550059
```