```
format long
type = 'd1_CtsLin' ;

alpha = 0.0;
beta = 2.0;

[uErr, DuErr] = Driver_1d(11,alpha,beta,true,1,type);
disp("Part A 2bi")
disp("Given the solution in the test space u(x)=3x-3 and 11 nodes, uErr= "+
uErr +" and DuErr= " +DuErr)

nnds = 2.^(3:7)+1 ;
l = zeros(size(nnds,2),3);
for i=1:size(nnds,2)
    h = (beta - alpha) / (nnds(i) - 1) ;
    %Driver_1d(nnds,alpha,beta, uTrue_Flag,num)
    [uErr, DuErr] = Driver_1d(nnds(i),alpha,beta,true,3,type);
    l(i,:)=[DuErr, h, 0];
end
for i=1:size(nnds, 2)-1
    l(i+1,3) = log(l(i,1)/l(i+1,1))/log(l(i,2)/l(i+1,2));
end
t=table(l(:,1),l(:,2),l(:,3));
t.Properties.VariableNames=["DuErr","h","alpha DuErr"];
disp("Part A 2bii")
disp("The experimental convergence rate for x^4+1 is given in the last
column of the table")
disp(t)
disp("Thus the experimental convergence rate is about 1, which is what we
would expect since" +...
    " the error in the H_1 norm should be in the first term because we are
using continuous linear aproximations.")
disp("I believe that my program works correctly as it solves the given
problems to the error" + ...
    " that we would expect given the continuous linear approximation")

type = 'd1_CtsQuad' ;
[uErr, DuErr] = Driver_1d(11,alpha,beta,true,2,type);
disp("Part B 2bi")
disp("Given the solution in the test space u(x)=3x^2-3 and 11 nodes, uErr=
"+ uErr +" and DuErr= " +DuErr)

l = zeros(size(nnds,2),3);
for i=1:size(nnds,2)
    h = (beta - alpha) / (nnds(i) - 1) ;
    %Driver_1d(nnds,alpha,beta, uTrue_Flag,num)
    [uErr, DuErr] = Driver_1d(nnds(i),alpha,beta,true,3,type);
    l(i,:)=[DuErr, h, 0];
end
for i=1:size(nnds, 2)-1
    l(i+1,3) = log(l(i,1)/l(i+1,1))/log(l(i,2)/l(i+1,2));
end
```

```
t=table(l(:,1),l(:,2),l(:,3));
t.Properties.VariableNames=["DuErr","h","alpha DuErr"];
disp("Part B 2bii")
disp("The experimental convergence rate for x^4+1 is given in the last
column of the table")
disp(t)
disp("Thus the experimental convergence rate is about 2, which is what we
would expect since" +...
    " the error in the H_1 norm should be in the second term because we are
using continuous quadratic aproximations.")
disp("I believe that my program works correctly as it solves the given
problems to the error" + ...
    " that we would expect given the continuous quadratic approximation")
```

```
Part A 2bi
Given the solution in the test space u(x)=3x-3 and 11 nodes, uErr=
1.1139e-15 and DuErr= 2.6422e-15
Part A 2bii
The experimental convergence rate for x^4+1 is given in the last column of
the table
          DuErr              h           alpha DuErr
    ___________________    ________    ________________

     2.18746043674998         0.25                    0
     1.09502382259906        0.125     0.998294667576797
    0.547670136700825       0.0625     0.999583135965761
    0.273854733748454      0.03125     0.999896396930765
    0.136929821488749     0.015625     0.999974137905819

Thus the experimental convergence rate is about 1, which is what we would
expect since the error in the H_1 norm should be in the first term because
we are using continuous linear aproximations.
I believe that my program works correctly as it solves the given problems to
the error that we would expect given the continuous linear approximation
Part B 2bi
Given the solution in the test space u(x)=3x^2-3 and 11 nodes, uErr=
5.0925e-15 and DuErr= 1.6708e-14
Part B 2bii
The experimental convergence rate for x^4+1 is given in the last column of
the table
           DuErr                h           alpha DuErr
    ____________________     ________    _________________

      0.0912325231126511         0.25                   0
      0.0228184327995164        0.125     1.99934850778997
     0.00570523562089518       0.0625     1.99984133399132
     0.00142634786344118      0.03125     1.99996059474968
    0.000356589396762037     0.015625     1.99999016498562

Thus the experimental convergence rate is about 2, which is what we would
expect since the error in the H_1 norm should be in the second term because
we are using continuous quadratic aproximations.
I believe that my program works correctly as it solves the given problems to
the error that we would expect given the continuous quadratic approximation
```

Published with MATLAB® R2023b