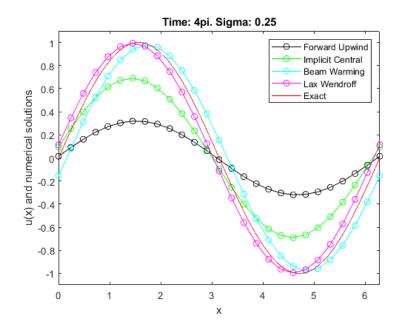
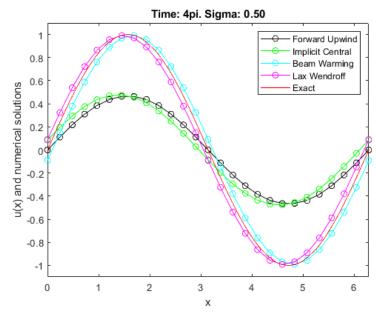
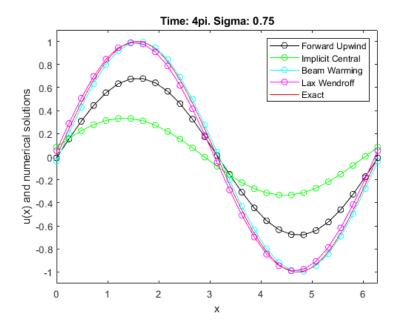
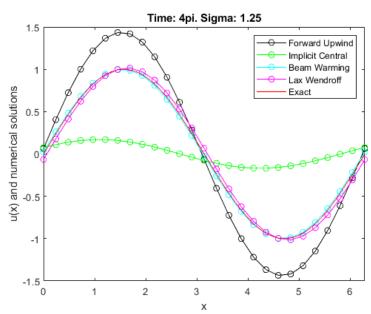
```
clear all; close all; clc;
c=1;
          % advective speed
           % computational domain [0,L]
L=2*pi;
T=2*2*pi; % end time
M=0;
          % intermediate solutions
fexact='exact.dat';
sigma= 0.25; % Courant number
%sigma = {.25,.5,.75,1.25};
          % number of interior points
%method='forward-upwind';
%method='implicit-central';
%method='beam-warming';
%method='lax-wendroff';
method = {'forward-upwind','implicit-central','beam-warming', ...
    'lax-wendroff'};
% initial conditions
u0 = @(x) \sin(x); % anonymous function
%out=wave_solve(c,L,n,sigma,T,M,u0,method);
% plot
xx=linspace(0,L,1000);
figure
sigma = .25;
colors = {'ko-','go-','co-','mo-'};
for k = 1:4
   clear out
   out=wave_solve(c,L,n,sigma,T,M,u0,method{k});
   plot(out.x,out.U(:,2),colors{k});
   hold on
   axis([0,L,-1.1,1.1]);
   xlabel('x');
   ylabel('u(x) and numerical solutions');
   title(sprintf('Time: 4pi. Sigma: %.2f',sigma));
plot(xx,u0(xx-out.TT(2)),'r-');
legend('Forward Upwind','Implicit Central','Beam Warming',...
    'Lax Wendroff', 'Exact')
figure
sigma = .5;
colors = {'ko-','go-','co-','mo-'};
for k = 1:4
   out=wave_solve(c,L,n,sigma,T,M,u0,method{k});
   plot(out.x,out.U(:,2),colors{k});
   hold on
   axis([0,L,-1.1,1.1]);
   xlabel('x');
   ylabel('u(x) and numerical solutions');
   title(sprintf('Time: 4pi. Sigma: %.2f',sigma));
plot(xx,u0(xx-out.TT(2)),'r-');
legend('Forward Upwind','Implicit Central','Beam Warming',...
    'Lax Wendroff', 'Exact')
figure
sigma = .75;
colors = {'ko-','go-','co-','mo-'};
for k = 1:4
   clear out
   out=wave solve(c,L,n,sigma,T,M,u0,method{k});
   plot(out.x,out.U(:,2),colors{k});
   hold on
   axis([0,L,-1.1,1.1]);
   xlabel('x');
   ylabel('u(x) and numerical solutions');
   title(sprintf('Time: 4pi. Sigma: %.2f',sigma));
plot(xx,u0(xx-out.TT(2)),'r-');
legend('Forward Upwind','Implicit Central','Beam Warming',...
```

```
'Lax Wendroff','Exact')
figure
sigma = 1.25;
colors = {'ko-','go-','co-','mo-'};
for k = 1:4
     clear out
     out=wave_solve(c,L,n,sigma,T,M,u0,method{k});
     plot(out.x,out.U(:,2),colors{k});
     hold on
     axis([0,L,-1.5,1.5]);
     xlabel('x');
     ylabel('u(x) and numerical solutions');
     title(sprintf('Time: 4pi. Sigma: %.2f',sigma));
plot(xx,u0(xx-out.TT(2)),'r-');
legend('Forward Upwind','Implicit Central','Beam Warming',...
     'Lax Wendroff', 'Exact')
%dump
%fout=sprintf('%s_n%g_sigma%f.dat',method,n,sigma);
%dlmwrite(fout,[out.x',out.U],'delimiter',' ','precision','%e');
%dlmwrite(fexact,[xx',exact],'delimiter',' ','precision','%e');
```









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