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% gda03_02
%
% comparison of norms
% supports Figure 3.2

% z's
N=31;
zmin=0;
zmax=10;
Dz=(zmax-zmin)/(N-1);
z=zmin+Dz*[0:N-1]';

% random errors
e = random('Uniform',-1,1,N,1);

% variery of powers of errors
e1 = abs(e);
E1 = sum(e1);
e2 = abs(e).^2;
E2 = sqrt(sum(e1));
e10 = abs(e).^10;
E10 = sum(e10)^0.1;
disp(sprintf('Errors E1 %f E2 %f E10 %f', E1, E2, E10));

```

Errors E1 14.769012 E2 3.843047 E10 1.114597

```

% plot of errors
figure(1);
clf;

% plot scale
pemin=-1;
pemax=1;

% plot error
subplot(4,1,1);
set(gca,'LineWidth',3);
set(gca,'FontSize',14);
hold on;
axis( [zmin, zmax, pemin, pemax ]' );
% improvise bar chart
for i=[1:N-1]
    plot( [z(i), z(i), z(i+1), z(i+1) ]', [0, e(i), e(i), 0]', 'k-', 'LineWidth', 2 );
end
xlabel('z');
ylabel('e');
plot( [zmin, zmax ]', [0, 0]', 'k-', 'LineWidth', 2 );

% plot |error|
subplot(4,1,2);
set(gca,'LineWidth',3);
set(gca,'FontSize',14);
hold on;
axis( [zmin, zmax, pemin, pemax ]' );
% improvise bar chart
for i=[1:N-1]
    plot( [z(i), z(i), z(i+1), z(i+1) ]', [0, e1(i), e1(i), 0]', 'k-', 'LineWidth', 2 );
end

```

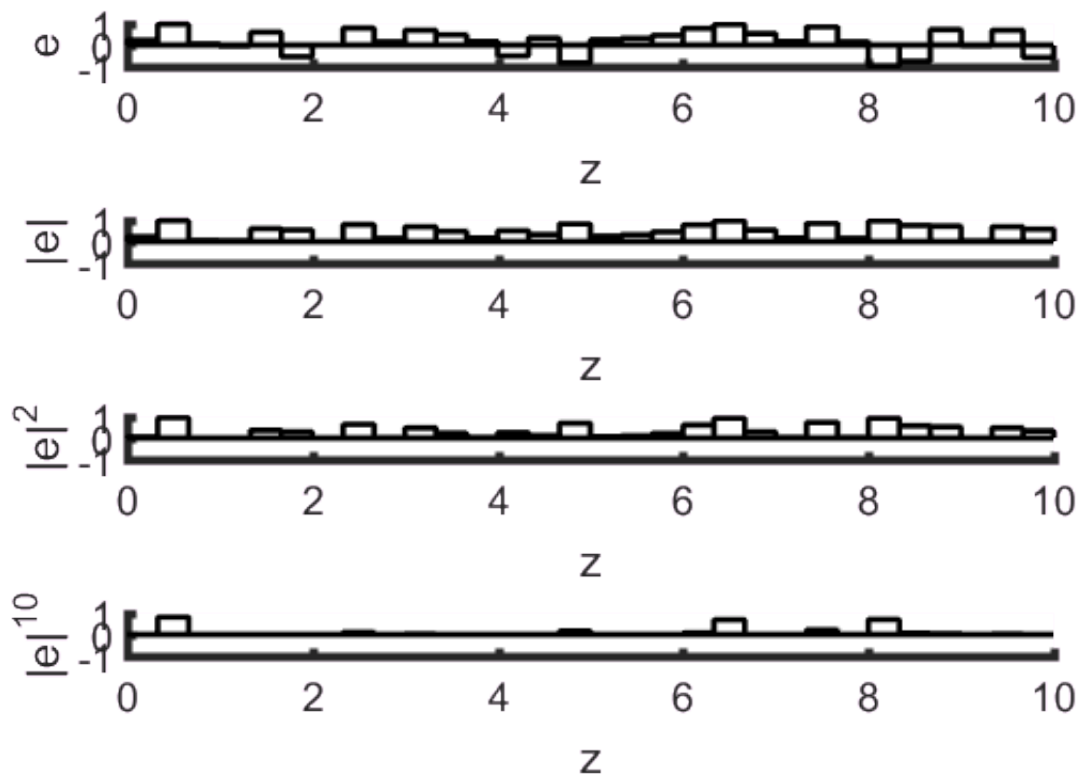
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xlabel('z');
ylabel('|e|');
plot( [zmin, zmax ], [0, 0]', 'k-', 'LineWidth', 2 );

% plot |error|^2
subplot(4,1,3);
set(gca, 'LineWidth', 3);
set(gca, 'FontSize', 14);
hold on;
axis( [zmin, zmax, pemin, pemax ]' );
% improvise bar chart
for i=1:N-1
    plot( [z(i), z(i), z(i+1), z(i+1) ]', [0, e2(i), e2(i), 0]', 'k-', 'LineWidth', 2 );
end
xlabel('z');
ylabel('|e|^2');
plot( [zmin, zmax ], [0, 0]', 'k-', 'LineWidth', 2 );

% plot |error|^10
subplot(4,1,4);
set(gca, 'LineWidth', 3);
set(gca, 'FontSize', 14);
hold on;
axis( [zmin, zmax, pemin, pemax ]' );
% improvise bar chart
for i=1:N-1
    plot( [z(i), z(i), z(i+1), z(i+1) ]', [0, e10(i), e10(i), 0]', 'k-', 'LineWidth', 2 );
end
xlabel('z');
ylabel('|e|^10');
plot( [zmin, zmax ], [0, 0]', 'k-', 'LineWidth', 2 );

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% Figure 3.2 Hypothetical prediction error,  $e_i(z_i)$ , and its absolute value, raised to the power  
% and 10. While most elements of  $|e_i|$  are numerically significant, only a few elements of  $|e_i|^{10}$ 
```