Common Code: dsplot.m

```matlab
function [] = dsplot(f, name, haxis, vaxis)
    stem(0:size(f) - 1, f);

    if nargin > 1
        title(name);
    end
    if nargin > 2
        xlabel(haxis, 'FontSize', 18);
    end
    if nargin > 3
        ylabel(vaxis, 'FontSize', 18);
    end

    set(gca, 'FontSize', 16);
    grid on;
end
```

Problem 17

Code:

```matlab
clear all;
N = 0:100;
a = [1, -1.15, 1.5, -.7, .25];
b = [.18, .1, .3, .1, .18];

figure;

% Part a
h = impz(b, a, N);
subplot(4, 1, 1);
dsplot(h, 'h[n]');

% Part b
x = ones(101, 1);
y = filter(b, a, x);
subplot(4, 1, 2);
dsplot(y, 'filter(b, a, u[n])');

% Part c
y = conv(h, x);
subplot(4, 1, 3);
dsplot(y, 'conv(h[n], u[n])');

% Part d
y = filter(h, 1, x);
subplot(4, 1, 4);
dsplot(y, 'filter(h[n], 1, u[n])');
```
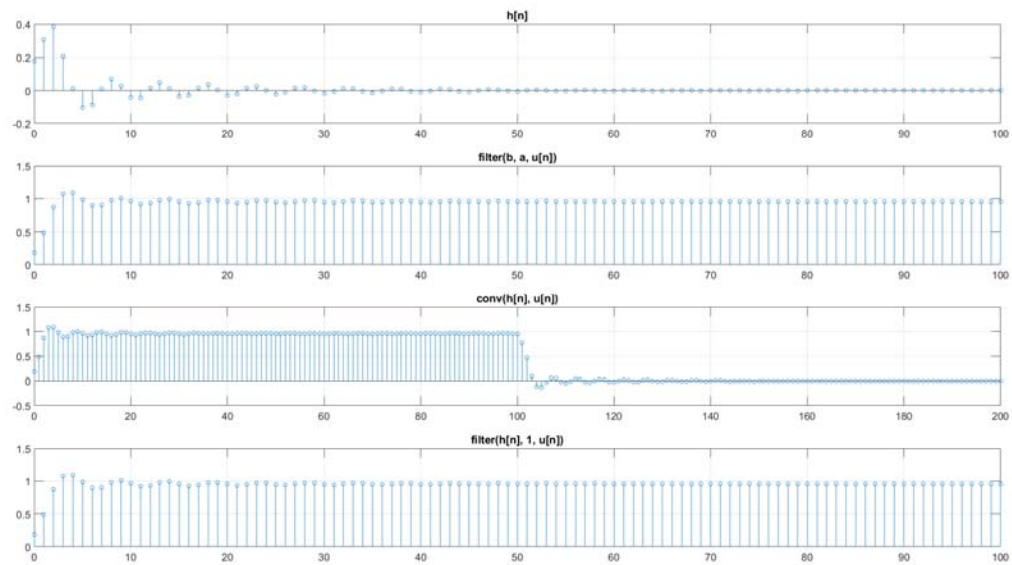
Problem 24

Code:

```
clear all;

x = load('djw6576.txt', '-ascii');
N = size(x, 1);

y1 = zeros(N, 1);
y2 = zeros(N, 1);
for n = 1:N
    % y1 = sum_(0)_(50){x[n-k]}/51
    for k = 0:50
        if (n - k > 0 && n - k <= N)
            y1(n) = y1(n) + x(n - k);
        end
    end
    y1(n) = y1(n) / 51;


    % y2 = sum_(-25)_(25){x[n-k]}/51
    for k = -25:25
        if (n - k > 0 && n - k <= N)
            y2(n) = y2(n) + x(n - k);
        end
    end
    y2(n) = y2(n) / 51;
end

figure;
subplot(3,1,1);
dsplot(x, 'x');
subplot(3,1,2);
```
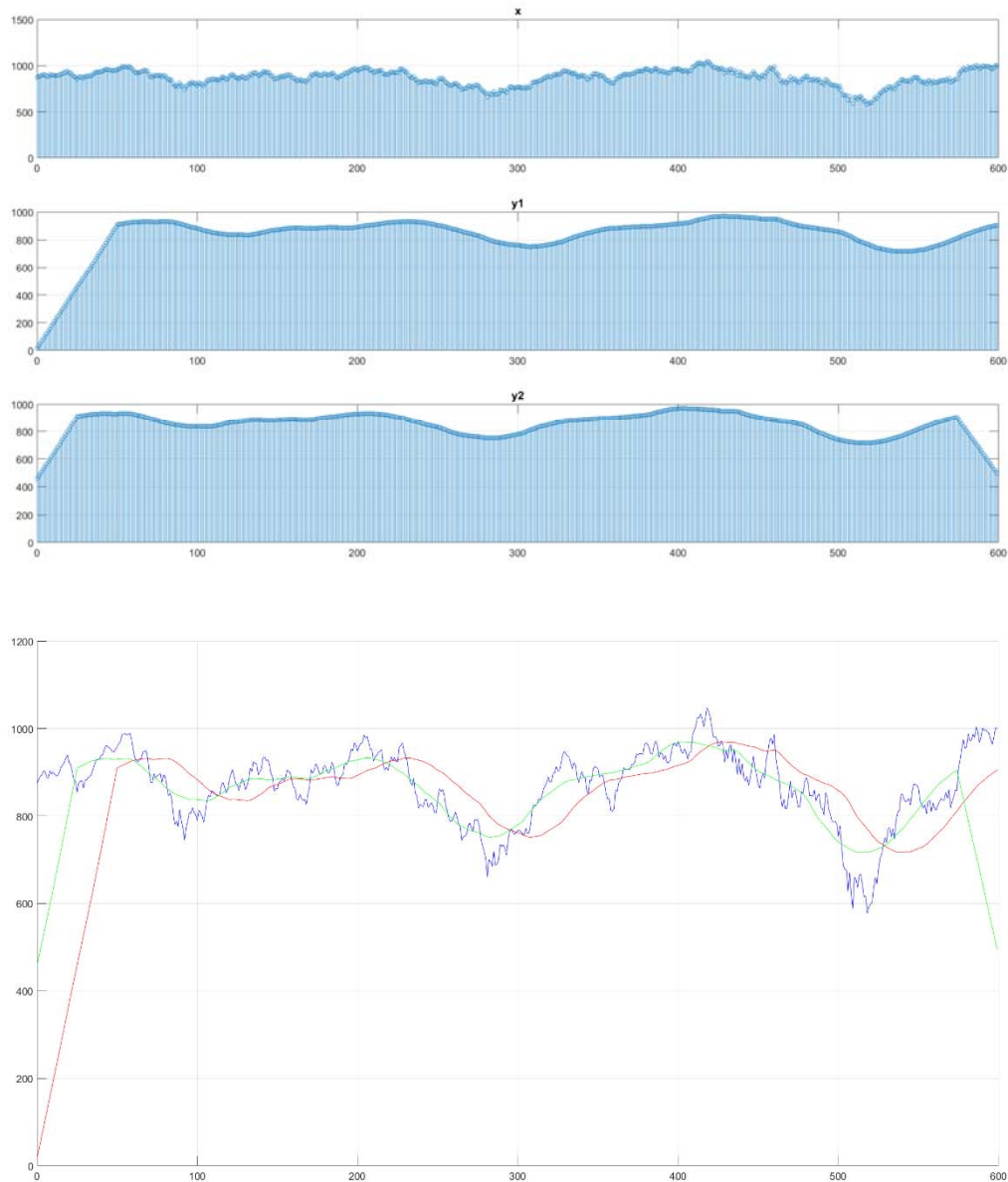
```
dsplot(y1, 'y1');
subplot(3,1,3);
dsplot(y2, 'y2');

figure;
hold all;
plot(0:N-1, x, 'blue');
plot(0:N-1, y1, 'red');
plot(0:N-1, y2, 'green');
set(gca, 'FontSize', 16);
grid on;
```
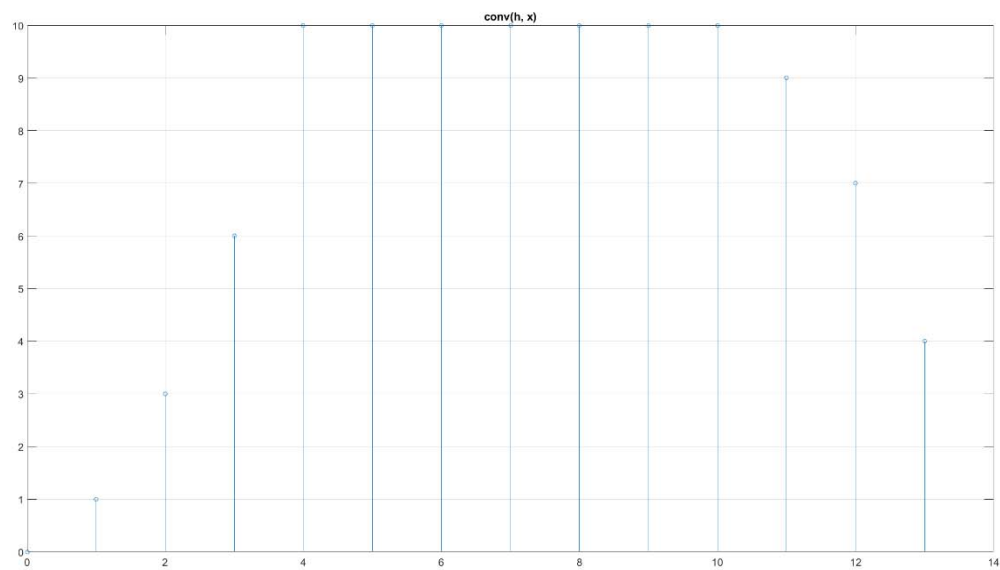

The book asked for a line plot with the 3 super-imposed (I know it's not continuous)

Problem 25

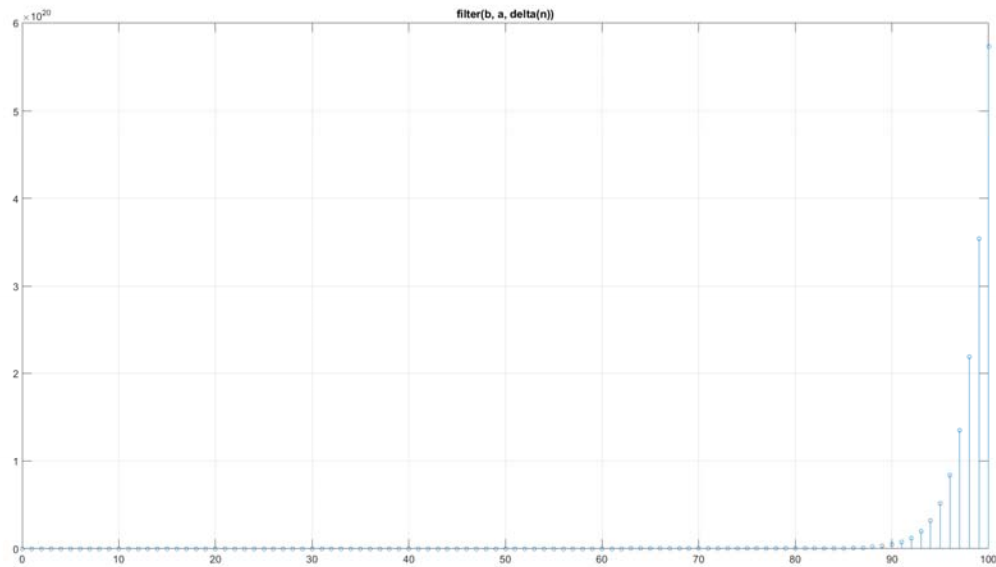Code:

```
clear all;
N = 10;
M = 5;
u = ones(1000, 1);

x = u(1:N);
h = 0:(M - 1) .* u(1:M);
y = conv(h, x);

figure;
dsplot(y, 'conv(h, x)');
```


Problem 31

Code:

```
clear all;
a = [1, -1, -1];
b = 1;
N = 0:100;

% delta function
x = zeros(101, 1);
x(1) = 1;

% impulse response
h = filter(b, a, x);

dsplot(h, 'filter(b, a, delta(n))');
```

Problem 54

Code:

```
clear all;

% delta matrix
d = zeros(3, 3);
d(2,2) = 1;

h = [0, 1, 0;
     1, -4, 1;
     0, 1, 0];

H = d - h;

x = imread('lena.jpg');
y = conv2(double(x), h);
f = conv2(double(x), H);

figure;

subplot(1, 3, 1);
imagesc(x);
title('Original');
axis image;
colormap gray;
colorbar;

subplot(1, 3, 2);
imagesc(y);
title('Laplacian');
axis image;
```
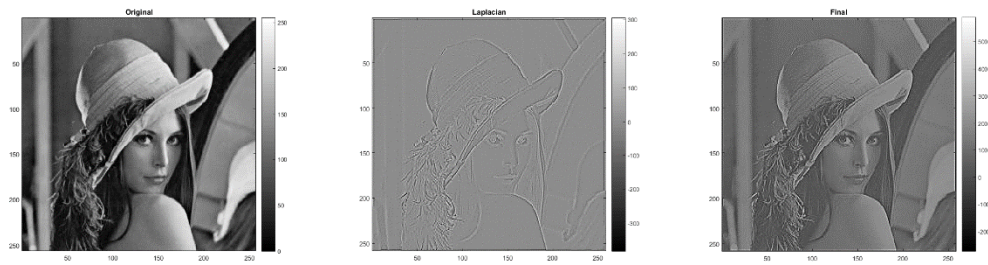
```
colormap gray;
colorbar;

subplot(1, 3, 3);
imagesc(f);
title('Final');
axis image;
colormap gray;
colorbar;
```


I not 100% certain what the images are supposed to look like; Matlab gave me weird warnings about using integers with conv2. I guess the image looks a little sharper after subtracting its Laplacian, but I don't notice it too much compared to the dramatic change in color.