Chapter 2

Problem 2

We have $g_1(t) = g(\alpha t)$, where α>1

Let $u = \alpha t$. This implies that $t = u/\alpha$ where α is the scaling factor with $\alpha > 1$

Then

$$FT\{g_1(t)\} = FT\{g(\alpha t)\} = \int_{-\infty}^{\infty} g(at)e^{-jft}dt = \int_{-\infty}^{\infty} g(u)e^{-jfu/\alpha}d(u/\alpha) = \frac{1}{\alpha}G\left(\frac{f}{|\alpha|}\right)$$

Problem 4

$$FT\{g_1(t) * g_2(t)\} = \int\left[\int x(\tau)y(t-\tau)d\tau\right]e^{-jft}dt$$

$$= \int x(\tau)\left[\int y(t-\tau)e^{-jft}dt\right]d\tau$$

$$= \int x(\tau)e^{-u\tau}\left[\int y(t-\tau)e^{-v(t-\tau)}d(t-\tau)\right]d\tau$$

$$= G_1(u) \cdot G_2(v)$$

Problem 6

As F(u) = g(t), we have

$$g(t) = F^{-1}\{G(u)\} = \frac{1}{2\pi}\int G(u)e^{jft}df$$

Let $t^{'} = -t,$ we get

$$g(-t^{'}) = \frac{1}{2\pi}\int G(jf)e^{-jft^{'}}df$$

Interchanging $t^{'}$ and f we get

$$2\pi g(-f) = \int G(t^{'})e^{-jft^{'}}dt^{'} = F\{G(t)\}$$

$$g(-f) = \int G(t^{'})e^{-j2\pi ft^{'}}dt^{'} = F\{G(t)\}$$

Problem 8:

Use the same code for problem 1-2 d to find the fft of the figna l

Problem 10:

```
Order=9;
Wn=[200]/(samplerate/2);
 [bl,al]=butter(n,Wn);
Filteredsig=filter(bl,al,SIG);
```

Chapter 3

Problem 2

```
I=imread('p_3_2.jpg');
I=rgb2gray(I);
figure;imshow(I);
S=size(I);
I=double(I);
I=dec2base(I,2);
newS=size(I)
J=zeros(S(1),S(2));
for i=1:newS(1)
    k=char(I(i,:));
   k(1) = '0';
   k(2) = '0';
   k(3) ='0';
 // k(4) = '0'; //Uncomment this line to solve section b
k=base2dec(k,2);
a=fix(i/S(1))+1;
b=mod(i,S(1));
if b == 0
        b=S(1);
        a=a-1;
end
J(b,a)=k;
end
figure;imshow(J,[0 255]);
```

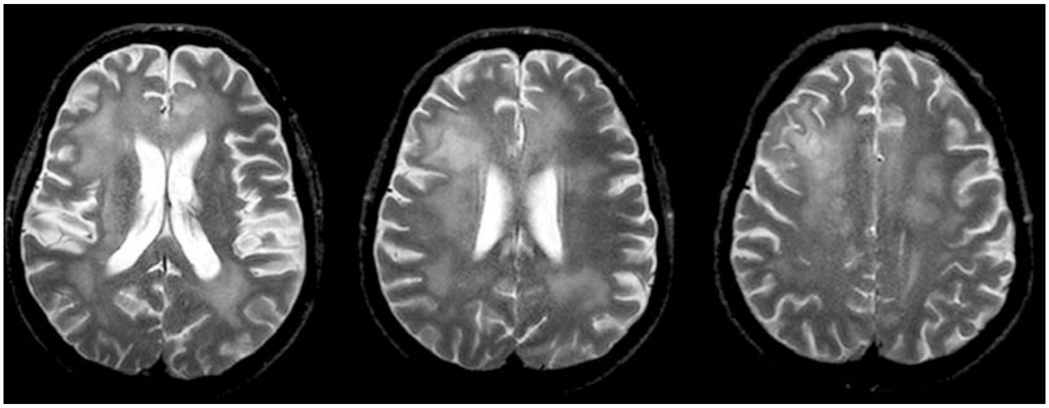

Image before elimination of any bit(file: p_3_2.jpg)