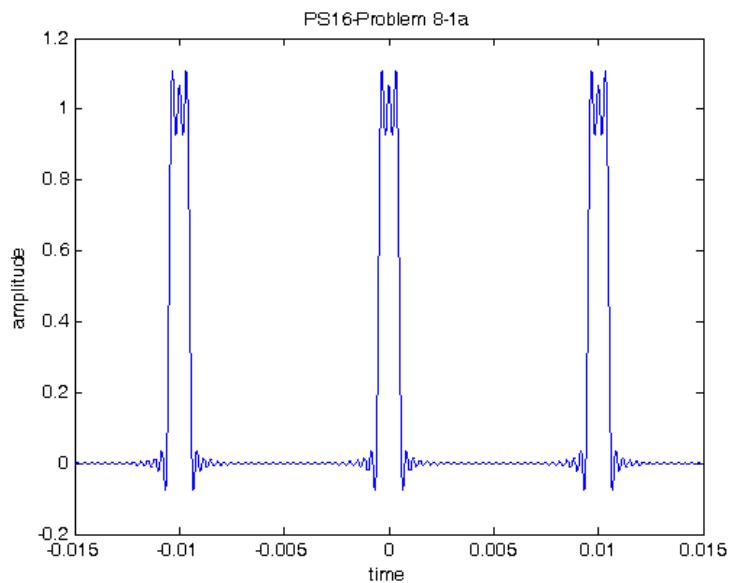
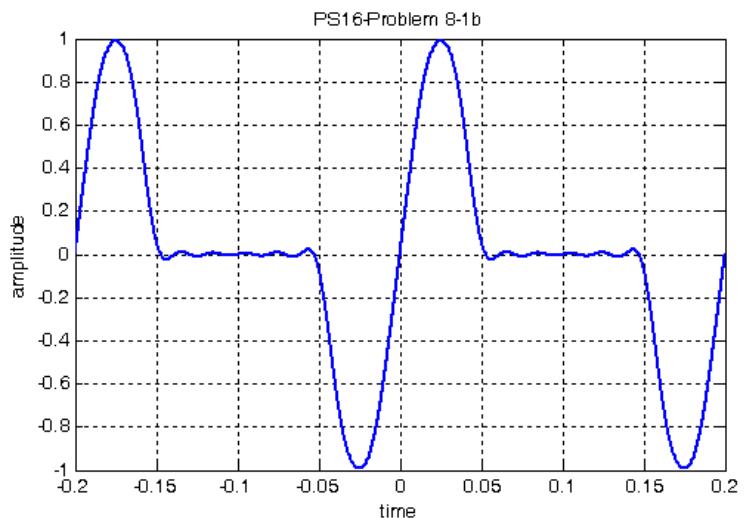


EE322 Fall 2012 PS24 - Solutions

```
%EE322 Fall 2012 PS24, problem 8-1a  
t=-15e-3:1e-6:15e-3; % initialize time  
vector  
  
x=zeros(size(t)); % initialize output vector  
for k=-30:30  
    x=x+sinc(k/10).*exp(j*200*pi*k*t);  
end  
x=1/10*x; % apply the scale factor  
plot(t,x)  
xlabel('time')  
ylabel('amplitude')  
title('PS16-Problem 8-1a')
```



```
%EE322 Fall 2012 PS24, problem 8-1b  
t=-200e-3:1e-6:200e-3; % initialize time vector  
x=zeros(size(t)); % initialize output vector  
for k=-9:9  
    x=x+(sinc((k+2)/2)-sinc((k-2)/2)).*exp(j*10*pi*k*t);  
end  
x=x*j/4; % apply the scale factor  
  
plot(t,x)  
grid  
xlabel('time')  
ylabel('amplitude')  
title('PS16-Problem 8-1b')
```



② Text, 8-26 c, d

$$(c) x(t) = 3 \sin(2\pi 3t) + 4 \cos(2\pi 4t) \quad T_F = 1, f_F = 1$$

$$x(t) = 3 \left(\frac{e^{j2\pi 3t} - e^{-j2\pi 3t}}{2j} \right) + 4 \left(\frac{e^{j2\pi 4t} + e^{-j2\pi 4t}}{2} \right)$$

$$= \frac{3}{2j} e^{j2\pi 3 \cdot 1 \cdot t} \uparrow \quad -\frac{3}{2j} e^{j2\pi(-3)1 \cdot t} \uparrow \quad + 2 e^{j2\pi 4 \cdot 1 \cdot t} \uparrow \quad + 2 e^{j2\pi(-4) \cdot 1 \cdot t} \uparrow$$

$k=3 \quad k=-3 \quad k=4 \quad k=-4$

$$\boxed{X[k] = \frac{3}{2j} \delta[k-3] - \frac{3}{2j} \delta[k+3] + 2 \delta[k-4] + 2 \delta[k+4]}$$

or

$$\boxed{X[k] = -j\frac{3}{2} \delta[k-3] + j\frac{3}{2} \delta[k+3] + 2 \delta[k-4] + 2 \delta[k+4]}$$

$$(d) x(t) = 2 \cos(2\pi 12t) - 8 \cos(2\pi 15t) + 6 \sin(2\pi 18t) \quad T_F = 2, f_F = \frac{1}{2}$$

$$x(t) = 2 \left(\frac{e^{j2\pi 12t} + e^{-j2\pi 12t}}{2} \right) - 8 \left(\frac{e^{j2\pi 15t} + e^{-j2\pi 15t}}{2} \right) + \frac{6}{2j} \left(e^{j2\pi 18t} - e^{-j2\pi 18t} \right)$$

$$= e^{j2\pi 24 \cdot \frac{1}{2} t} \uparrow + e^{j2\pi(-24) \frac{1}{2} t} \uparrow \quad -4e^{j2\pi 30 \cdot \frac{1}{2} t} \uparrow -4e^{j2\pi(-30) \frac{1}{2} t} \uparrow + j \frac{3}{j} e^{j2\pi 36 \cdot \frac{1}{2} t} \uparrow -j \frac{3}{j} e^{j2\pi(-36) \frac{1}{2} t} \uparrow$$

$k=24 \quad k=-24 \quad k=30 \quad k=-30 \quad k=36 \quad k=-36$

$$\boxed{X[k] = \delta[k-24] + \delta[k+24] - 4\delta[k-30] - 4\delta[k+30] - 3j\delta[k-36] + 3j\delta[k+36]}$$

③ Text 8-29

$$x(t) = 5 \cos(2\pi 10 t) \quad f_F = 10, \quad T_F = \frac{1}{f_F}$$

For this problem, use $T_F' = 2 T_F = \frac{2}{10} = \frac{1}{5}$,

$$\text{so } f_{F'} = 5$$

$$x(t) = 5 \cos(2\pi 10 t) = \frac{5}{2} e^{j2\pi 10 t} + \frac{5}{2} e^{-j2\pi 10 t}$$

$$= \frac{5}{2} e^{j2\pi(2)5t} + \frac{5}{2} e^{j2\pi(-2)5t}$$

$\uparrow \quad \downarrow$
 $k=2 \quad k=-2$

$$X[k] = \frac{5}{2} S[k-2] + \frac{5}{2} S[k+2]$$