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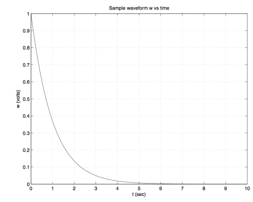
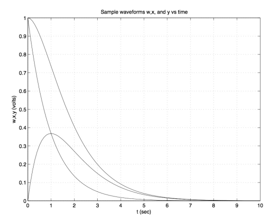
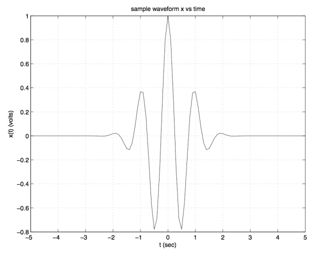
% Matlab plotting basics
t = 0:.1:10;
w = exp(-t);
x = t.*exp(-t);
y = exp(-t) + t.*exp(-t);
plot(t,w)
grid on;
xlabel('t (sec)');
ylabel('w (volts)');
title('Sample waveform w vs. time');
print(figure,'graph1');
```



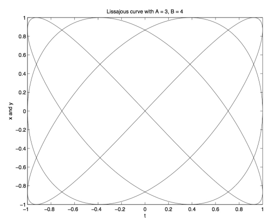
```
plot(t,w,t,x,t,y);
xlabel('t (sec)');
ylabel('w,x,y (volts)');
title('Sample waveforms w,x, and y vs time');
print(figure,'graph2')
```



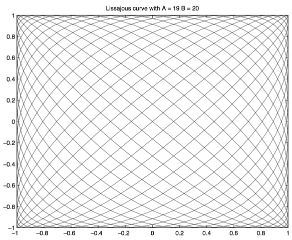
```
% Task 1
% Part A
t = -5:.0:5;
x =  exp(-t.*t) .* cos(2 * pi * t);
plot(t,x);
xlabel('t (sec)');
ylabel('x(t) (volts)');
title('sample waveform x vs time');
print(figure,'graph3')
```



```
% Part B
t = 0:.001:1;
A = 3;
B = 4;
x = cos(2 * pi * A .* t);
y = sin(2 * pi * B .* t);
plot(x,y);
title('Lissajous curve with A = 3, B = 4');
print(figure(1),'lissajouscurve');
```



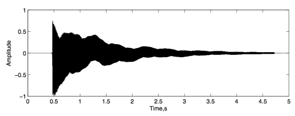
```
A = 19;
B = 20;
x = cos(2 * pi * A .* t);
y = sin(2 * pi * B .* t);
xlabel('t');
ylabel('x and y');
title('Lissajous curve with A = 19, B = 20');
print(figure(1),'lissajouscurve2');
```



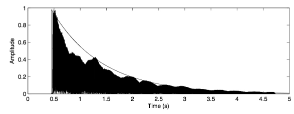
Student Version of MATLAB

```
%Task 2

t =[1:length(d)] * dt;
plot(t(1:8:end),d(1:8:end));
xlabel('Time,s');
ylabel('Amplitude');
title('Guitar note');
subplot(211);
print(figure(1),'guitarnote')
```



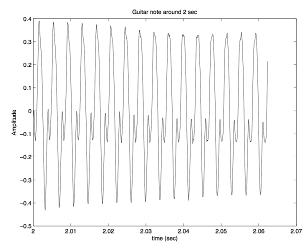

```
ls = length(d);
% Note starts approximately at .45 seconds.
ns = round(.45/dt);
% at t = .45 the absolute peak is .98 and at t = 2.25 the amplitude drops to .15
% Then we have an system of equations to solve:
% .98 = a * exp(sigma * .45)
% and .15 = a * exp(sigma * 2.25)
% this allows us to solve for sigma and a
sigma = log(.15/.98)/(2.25 - .45);
a = .98 /exp(.45 * sigma);
ld = ls;
% Then the delay waveform is
de = [zeros(1,ns) a * exp(sigma * t(ns + 1 : ld))];
subplot(211)
plot(t,abs(d),t,de);
xlabel('Time (s)');
ylabel('Amplitude');
print(figure(1),'Delayed_waveform_guitar')
```




```
n1 = 1 * fs;
n2 = round((1+ 1/16) * fs);
ds = d (n1:n2);
lds = length(ds);
dt = (1/16)/lds;

time = 2 : dt : (2+ 1/16) - dt;
plot(time,ds)
xlabel('time (sec)');
ylabel('Amplitude')

title('Guitar note around 2 sec');
print(figure(1),'guitarnote2sec');
```



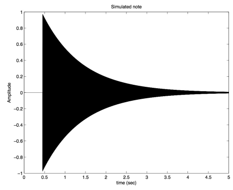
Student Version of MATLAB

```
% 34 cycles in the graph
np = 34;
% The frequency is the sampling rate / number of cycle
fp = fs/np;
```

```
% and the period is one over the frequency
tp = 1/fp;
% Middle C
fp =

  259.4118

plot(ds(1:lds-np) - ds(1+np:lds));
ylabel('Amplitude')
print(figure(1),'zeroguitar')
```



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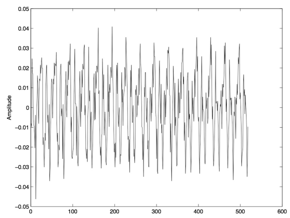

Student Version of MATLAB

```
% period
T = dt * np

T =

   0.0038
% part d
dsim = de.* sin(2*pi * fp * t);
sound(dsim,fs)
% They are the same note and fade at the
same rate
plot(t,dsim)
xlabel('time (sec)');
ylabel('Amplitude');
title('Simulated note');
print(figure(1),'simnote');
```