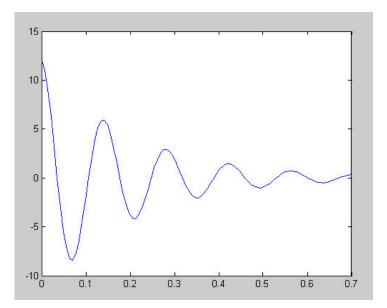
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1

# **CHAPTER 2**

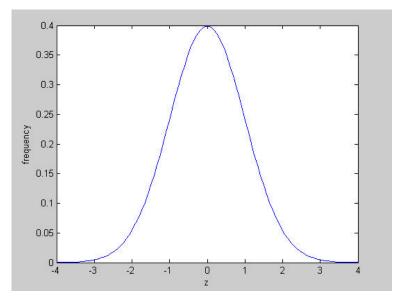
```
2.1
>> q0 = 12;R = 50;L = 5;C = 1e-4;
>> t = linspace(0,.7);
>> q = q0*exp(-R*t/(2*L)).*cos(sqrt(1/(L*C)-(R/(2*L))^2)*t);
>> plot(t,q)
```



2.2

```
>> z = linspace(-4,4);
>> f = 1/sqrt(2*pi)*exp(-z.^2/2);
>> plot(z,f)
>> xlabel('z')
```

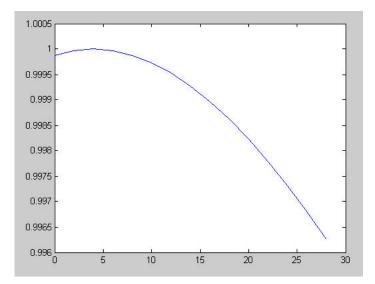
```
>> ylabel('frequency')
```



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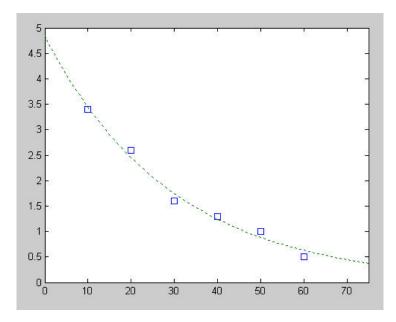
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2.3(a)>> t = linspace(5,29,5) t = 5 11 17 23 29 *(b)* >> x = linspace(-3, 4, 8)x = -3 -2 -1 0 1 2 3 4 2.4 (a) >> v = -3:0.5:1 v = -3.0000 -2.5000 -2.0000 -1.5000 -1.0000 -0.5000 0 0.5000 1.0000 **(b)** >> r = 8:-0.5:0r = Columns 1 through 6 7.0000 6.5000 6.0000 5.5000 8.0000 7.5000 Columns 7 through 12 4.0000 5.0000 4.5000 3.5000 3.0000 2.5000 Columns 13 through 17 2.0000 1.5000 1.0000 0.5000 0 2.5 >> F = [11 12 15 9 12]; >> x = [0.013 0.020 0.009 0.010 0.012]; >> k = F./xk = 1.0e+003 \* 0.8462 0.6000 1.6667 0.9000 1.0000 >> U = .5\*k.\*x.^2 U = 0.0715 0.1200 0.0675 0.0450 0.0720 >> max(U) ans = 0.1200 2.6 >> TF = 32:3.6:82.4; >> TC = 5/9\*(TF-32);>> rho = 5.5289e-8\*TC.^3-8.5016e-6\*TC.^2+6.5622e-5\*TC+0.99987; >> plot(TC,rho)

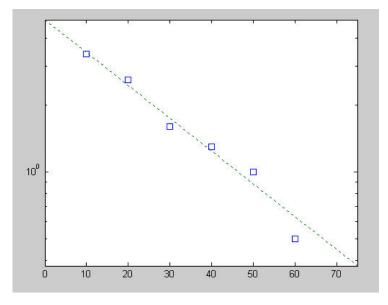


```
>> A = [.035 .0001 10 2;
0.02 0.0002 8 1;
0.015 0.001 19 1.5;
0.03 0.0008 24 3;
0.022 0.0003 15 2.5]
A =
    0.0350
              0.0001
                       10.0000
                                   2.0000
    0.0200
              0.0002
                        8.0000
                                   1.0000
    0.0150
              0.0010
                       19.0000
                                   1.5000
    0.0300
              0.0008
                       24.0000
                                   3.0000
    0.0220
              0.0003
                       15.0000
                                   2.5000
>> U = sqrt(A(:,2))./A(:,1).*(A(:,3).*A(:,4)./(A(:,3)+2*A(:,4))).*(2/3)
U =
    0.3624
    0.6094
    2.5053
    1.6900
    1.1971
2.8
>> t = 10:10:60;
>> c = [3.4 2.6 1.6 1.3 1.0 0.5];
>> tf = 0:75;
>> cf = 4.84*exp(-0.034*tf);
>> plot(t,c,'s',tf,cf,':')
```

```
>> xlim([0 75])
```



```
>> t = 10:10:60;
>> c = [3.4 2.6 1.6 1.3 1.0 0.5];
>> tf = 0:70;
>> cf = 4.84*exp(-0.034*tf);
>> semilogy(t,c,'s',tf,cf,'--')
```



The result is a straight line. The reason for this outcome can be understood by taking the common logarithm of the function to give,

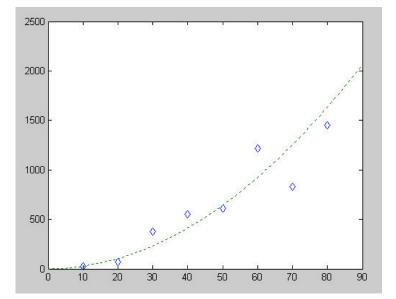
 $\log_{10} c = \log_{10} 4.84 - 0.034t \log_{10} e$ 

Because  $log_{10}e = 0.4343$ , this simplifies to the equation for a straight line,

 $\log_{10} c = 0.6848 - 0.0148t$ 

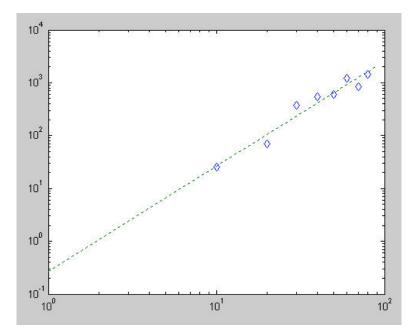
### 2.10

```
>> v = 10:10:80;
>> F = [25 70 380 550 610 1220 830 1450];
>> vf = 0:90;
>> Ff = 0.2741*vf.^1.9842;
>> plot(v,F,'d',vf,Ff,':')
```

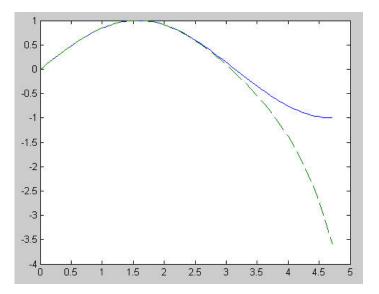


#### 2.11

```
>> v = 10:10:80;
>> F = [25 70 380 550 610 1220 830 1450];
>> vf = 0:90;
>> Ff = 0.2741*vf.^1.9842;
>> loglog(v,F,'d',vf,Ff,':')
```



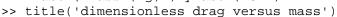
```
>> x = linspace(0,3*pi/2);
>> s = sin(x);
>> sf = x-x.^3/factorial(3)+x.^5/factorial(5)-x.^7/factorial(7);
>> plot(x,s,x,sf,'--')
```

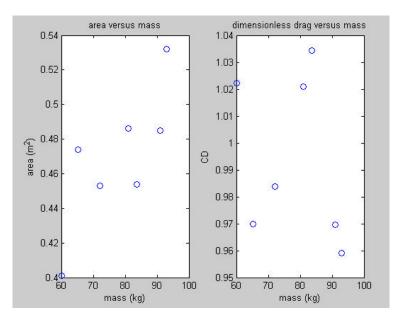


# 2.13 (a)

>> m=[83.6 60.2 72.1 91.1 92.9 65.3 80.9];
>> vt=[53.4 48.5 50.9 55.7 54 47.7 51.1];
>> g=9.81; rho=1.225;
>> A=[0.454 0.401 0.453 0.485 0.532 0.474 0.486];
>> cd=g\*m./vt.^2;
>> CD=2\*cd/rho./A

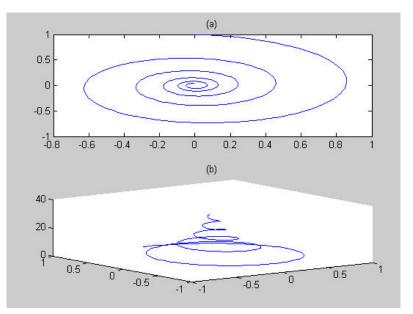
```
CD =
    1.0343
              1.0222
                         0.9839
                                   0.9697
                                              0.9591
                                                        0.9698
                                                                   1.0210
(b)
>> CDavg=mean(CD), CDmin=min(CD), CDmax=max(CD)
CDavg =
    0.9943
CDmin =
    0.9591
CDmax =
    1.0343
(b)
>> subplot(1,2,1);plot(m,A,'o')
>> xlabel('mass (kg)');ylabel('area (m^2)')
>> title('area versus mass')
>> subplot(1,2,2);plot(m,CD,'o')
>> xlabel('mass (kg)');ylabel('CD')
```





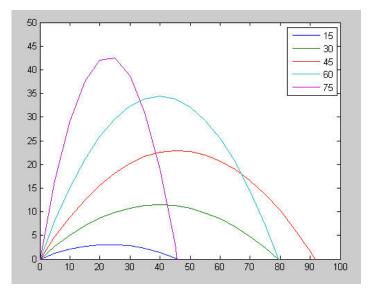
#### 2.14 (a)

t = 0:pi/50:10\*pi; subplot(2,1,1);plot(exp(-0.1\*t).\*sin(t),exp(-0.1\*t).\*cos(t)) title('(a)') subplot(2,1,2);plot3(exp(-0.1\*t).\*sin(t),exp(-0.1\*t).\*cos(t),t); title('(b)')



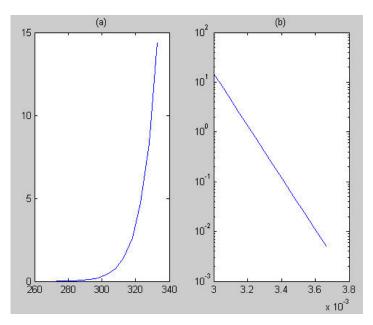
```
2.15 (a)
```

```
>> x = 2;
>> x ^ 3;
>> y = 8 - x
y =
     б
(b)
>> q = 4:2:10;
>> r = [7 8 4; 3 6 -2];
>> sum(q) * r(2, 3)
ans =
   -56
2.16
>> y0=0;v0=30;q=9.81;
>> x=0:5:100;
>> theta0=15*pi/180;
>> y1=tan(theta0)*x-g/(2*v0^2*cos(theta0)^2)*x.^2+y0;
>> theta0=30*pi/180;
>> y2=tan(theta0)*x-g/(2*v0^2*cos(theta0)^2)*x.^2+y0;
>> theta0=45*pi/180;
>> y3=tan(theta0)*x-g/(2*v0^2*cos(theta0)^2)*x.^2+y0;
>> theta0=60*pi/180;
>> y4=tan(theta0)*x-g/(2*v0^2*cos(theta0)^2)*x.^2+y0;
>> theta0=75*pi/180;
>> y5=tan(theta0)*x-g/(2*v0^2*cos(theta0)^2)*x.^2+y0;
>> y=[y1' y2' y3' y4' y5']
>> plot(x,y)
>> axis([0 100 0 50])
>> legend('15','30','45','60','75')
```



```
>> R=8.314;E=1e5;A=7E16;
>> Ta=273:5:333;
>> k=A*exp(-E./(R*Ta))
k =
 Columns 1 through 10
             0.0113
                       0.0244
                                0.0510 0.1040
                                                    0.2070
                                                              0.4030
    0.0051
0.7677
        1.4326
                   2.6213
 Columns 11 through 13
             8.3048
    4.7076
                      14.4030
```

```
>> subplot(1,2,1);plot(Ta,k)
>> subplot(1,2,2);semilogy(1./Ta,k)
```



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The result in (b) is a straight line. The reason for this outcome can be understood by taking the common logarithm of the function to give,

$$\log_{10} k = \log_{10} A - \left(\frac{E}{R} \log_{10} e\right) \frac{1}{T_a}$$

Thus, a plot of  $\log_{10}k$  versus  $1/T_a$  is linear with a slope of  $-(E/R)\log_{10}e = -5.2237 \times 10^3$  and an intercept of  $\log_{10}A = 16.8451$ .

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