Chapter 1
Solved Problems

Problem 1

Script file:

```
clear, clc
disp('Part (a)')
(22+5.1^2)/(50-6.3^2)
disp('Part (b)')
44/7+8^2/5-99/3.9^2
```

Command Window:

```
Part (a)
ans =
    4.6566
Part (b)
ans =
   12.5768
```

Problem 2

Script file:

```
clear, clc
disp('Part (a)')
sqrt(41^2-5.2^2)/(exp(5)-100.53)
disp('Part (b)')
%alternative: nthroot(132,3)+log(500)/8
132^(1/3)+log(500)/8
```

Command Window:

```
Part (a)
ans =
    0.8493
Part (b)
ans =
    5.8685
```

Problem 3

Script file:

```
clear, clc
disp('Part (a)')
(14.8^3-6.3^2)/(sqrt(13)+5)^2
disp('Part (b)')
45*(288/9.3-4.6^2)-1065*exp(-1.5)
```

Command Window:

```
Part (a)
ans =
   43.2392
Part (b)
ans =
  203.7148
```

Problem 4

Script file:

```
clear, clc
disp('Part (a)')
(24.5+64/3.5^2+8.3*12.5^3)/(sqrt(76.4)-28/15)
disp('Part (b)')
(5.9^2-2.4^2)/3+(log10(12890)/exp(0.3))^2
```

Command Window:

```
Part (a)
ans =
   2.3626e+03
Part (b)
ans =
   18.9551
```

Problem 5

Script file:

```
clear, clc
disp('Part (a)')
%alternative:  sin(15*pi/180) instead of sind(15)
cos(7*pi/9)+tan(7*pi/15)*sind(15)
disp('Part (b)')
%alternatives:  could use nthroot(0.18,3), could convert to radians
%and use regular trig functions
sind(80)^2-(cosd(14)*sind(80))^2/(0.18)^(1/3)
```

Command Window:

```
Part (a)
ans =
    1.6965
Part (b)
ans =
   -0.6473
```

Problem 6

Script file:

```
clear, clc
x=6.7;
disp('Part (a)')
0.01*x^5-1.4*x^3+80*x+16.7
disp('Part (b)')
sqrt(x^3+exp(x)-51/x)
```

Command Window:

```
ans =
  266.6443
Part (b)
ans =
   33.2499
```

Problem 7

Script file:

```
clear, clc
t=3.2;
disp('Part (a)')
56*t-9.81*t^2/2
disp('Part (b)')
14*exp(-0.1*t)*sin(2*pi*t)
```

Command Window:

```
Part (a)
ans =
  128.9728
Part (b)
ans =
    9.6685
```

Problem 8

Script file:

```
clear, clc
x=5.1; y=4.2;
disp('Part (a)')
3/4*x*y-7*x/y^2+sqrt(x*y)
disp('Part (b)')
(x*y)^2-(x+y)/(x-y)^2 +sqrt((x+y)/(2*x-y))
```

Command Window:

```
Part (a)
ans =
   18.6694
Part (b)
ans =
  448.5799
```

Problem 9

Script file:

```
clear, clc
a=12; b=5.6; c=3*a/b^2; d=(a-b)^c/c;
disp('Part (a)')
a/b+(d-c)/(d+c)-(d-b)^2
disp('Part (b)')
exp((d-c)/(a-2*b))+log(abs(c-d+b/a))
```

Command Window:

```
Part (a)
ans =
   -0.1459
Part (b)
ans =
   2.2925e+03
```

Problem 10

Script file:

```
clear, clc
r=24;
disp('Part (a)')
%need to solve (a)(a/2)(a/4)=4/3 pi r^3
%could also use ^(1/3)
a=nthroot(8*4/3*pi*r^3,3)
disp('Part (b)')
%need to solve 2(a^2/2+a^2/4+a^2/8)=4 pi r^2
a=sqrt(4/7*4*pi*r^2)
```

Command Window:

```
Part (a)
a =
   77.3756
Part (b)
a =
   64.3128
>>
```

Problem 11

Script file:

```
clear, clc
a=11; b=9;
%could be one long expression
s=sqrt(b^2+16*a^2);
Labc = s/2 + b^2/(8*a)*log((4*a+s)/b)
```

Command Window:

```
Labc =
   24.5637
```

Problem 12

Script file:

```
clear, clc
```

```
x=pi/12;
disp('Part (a)')
%compare LHS and RHS
LHS = sin(5*x)
RHS = 5*sin(x)-20*sin(x)^3+16*sin(x)^5
disp('Part (b)')
LHS = sin(x)^2*cos(x)^2
RHS = (1-cos(4*x))/8
```

Command Window:

```
Part (a)
LHS =
    0.9659
RHS =
    0.9659
Part (b)
LHS =
    0.0625
RHS =
    0.0625
```

Problem 13

Script file:

```
clear, clc
x=24;
disp('Part (a)')
%compare LHS and RHS
LHS = tand(3*x)
RHS = (3*tand(x)-tand(x)^3)/(1-3*tand(x)^2)
disp('Part (b)')
LHS = cosd(4*x)
RHS = 8*(cosd(x)^4-cosd(x)^2)+1
```

Command Window:

```
Part (a)
LHS =
    3.0777
RHS =
    3.0777


Part (b)
LHS =
   -0.1045
RHS =
   -0.1045
```

Problem 14

Script file:

```
clear, clc
alpha=pi/6; beta=3*pi/8;
%compare LHS and RHS
LHS = sin(alpha)+sin(beta)
RHS = 2*sin((alpha+beta)/2)*cos((alpha-beta)/2)
```

Command Window:

```
LHS =
    1.4239
RHS =
    1.4239
```

Problem 15

Script file:

```
clear, clc
Integral=sin(a*3*pi/2)/a^2 - 3*pi/2*cos(a*3*pi/2)/a - ...
    sin(a*pi/3)/a^2 + pi/3*cos(a*pi/3)/a
```

Command Window:

```
Integral =
    8.1072
```

Problem 16

Script file:

```
clear, clc
a=5.3; gamma=42; b=6;
disp('Part (a)')
c=sqrt(a^2+b^2-2*a*b*cosd(gamma))
disp('Part (b)')
alpha = asind(a*sind(gamma)/c)
beta = asind(b*sind(gamma)/c)
disp('Part (c)')
Total = alpha+beta+gamma
```

Command Window:

```
Part (a)
c =
    4.1019
```

```
Part (b)
alpha =
   59.8328
beta =
   78.1672
Part (c)
Total = 180.0000
```

Problem 17

Script file:

```
clear, clc
a=5; b=7; gamma=25;
disp('Part (a)')
c=sqrt(a^2+b^2-2*a*b*cosd(gamma))
disp('Part (b)')
alpha = asind(a*sind(gamma)/c)
%note that beta is over 90 deg and asind will give 1st quadrant
beta = 180 - asind(b*sind(gamma)/c)
disp('Part (c)')
%compare LHS with RHS
LHS=(a-b)/(a+b)
RHS=tand((alpha-beta)/2)/tand((alpha+beta)/2)
```

Command Window:

```
Part (a)
c =
    3.2494
Part (b)
alpha =
   40.5647
beta =
  114.4353
Part (c)
LHS =
   -0.1667
RHS =
   -0.1667
```

Problem 18

Script file:

```
clear, clc
L=4; theta=35;
%radius of cone opening and height
r=L*sind(theta/2);
H=L*cosd(theta/2);
%volume of cone + volume of hemisphere
V=pi*r^2*H/3 + 2/3*pi*r^3
```

Command Window:

```
V =
    9.4245
```

Problem 19

Script file:

```
clear, clc
x=48; b=34; gamma=83;
disp('Part (a)')
c=sqrt(a^2+b^2-2*a*b*cosd(gamma))
disp('Part (b)')
s=(a+b+c)/2;
r=a*b*c/(4*sqrt(s*(s-a)*(s-b)*(s-c)))
```

Command Window:

```
Part (a)
c =
   33.7574
Part (b)
r =
   17.0055
```

Problem 20

Script file:

```
clear, clc
x0=-4; y0=-2; z0=-3; a=0.6; b=0.5; c=0.7;
xA=2; yA=-3; zA=1;
dA0=sqrt((xA-x0)^2+(yA-y0)^2+(zA-z0)^2);
d=dA0*sin(acos(((xA-x0)*a+(yA-y0)*b+(zA-z0)*c)/(dA0*sqrt(a^2+b^2+c^2))))
```

Command Window:

```
d =
    4.6211
```

Problem 21

Script file:

```
clear, clc
a=16; b=11;
C=pi*(3*(a+b)-sqrt((3*a+b)*(a+3*b)))
```

Command Window:

```
C =
   85.5518
```

Problem 22

Script file:

```
clear, clc
%alternate 37-rem(315,37)
empty=37*ceil(315/37)-315
```

Command Window:

```
empty =
    18
```

Problem 23

Script file:

```
clear, clc
%alternate rem(739,54)
unpacked=739-54*fix(739/54)
```

Command Window:

```
unpacked =
    37
```

Problem 24

Script file:

```
clear, clc
format long g
variable=316501.673;
%note basic matlab only has round function to nearest integer
%symbolic math toolbox has round function that allows rounding to
%specified digit, i.e round(variable,2) will round to 2nd digit after
%the decimal point, round(variable,-3) will round to the thousands digit.
disp('Part (a)')
round(100*variable)/100
disp('Part (b)')
round(variable/1000)*1000
```

Command Window:

```
Part (a)
ans =
                316501.67
Part (b)
ans =
      317000
```

Problem 25

Script file:

```
clear, clc
V=14; R1=120.6; R2=119.3; R3=121.2; R4=118.8;
Vab=V*(R1*R3-R2*R4)/((R1+R3)*(R3+R4))
```

Command Window:

```
Vab =
    0.1071
```

Problem 26

Script file:

```
clear, clc
L=0.15; R=14; C=2.6e-6;
f=1/(2*pi)*sqrt(1/(L*C)-(R/L)^2)
```

Command Window:

```
f =
  254.4186
```

Problem 27

Script file:

```
clear, clc
L=0.15; R=14; C=2.6e-6;
disp('Part (a)')
number_combinations=factorial(49)/(factorial(6)*factorial(49-6))
disp('Part (b)')
chance_of_2=factorial(6)/(factorial(2)*factorial(6-2))* ...
    factorial(43)/(factorial(4)*factorial(43-4))/ ...
    (factorial(49)/(factorial(6)*factorial(49-6)))
```

Command Window:

```
Part (a)
number_combinations =
    13983816
Part (b)
chance_of_2 =
    0.1324
```

Problem 28

Script file:

```
disp('Part (a)')
log4=log(0.085)/log(4)
disp('Part (b)')
log6=log10(1500)/log10(6)
```

Command Window:

```
Part (a)
log4 =
   -1.7782
Part (b)
log6 =
    4.0816
```

Problem 29

Script file:

```
clear, clc
R1=120; R2=220; R3=75; R4=130;
Req=1/(1/R1+1/R2+1/R3+1/R4)
```

Command Window:

```
Req =
   29.4947
```

Problem 30

Script file:

```
clear, clc
V0=36; R=2500; C=1600E-6; t=8;
VC=V0*(1-exp(-t/(R*C)))
```

Command Window:

```
VC =
   31.1279
```

Problem 31

Script file:

```
clear, clc
k=log(0.5)/5730;
Age=round(log(.7745)/k)
```

Command Window:

```
Age =
        2112
```

Problem 32

Script file:

```
clear, clc
disp('Part (a)')
gcd(91,147)
disp('Part (b)')
gcd(555,962)
```

Command Window:

```
Part (a)
ans =
     7
Part (b)
ans =
    37
```

Problem 33

Script file:

```
clear, clc
ratio=10^(3*(9.5+10.7)/2)/10^(3*(8.7+10.7)/2)
```

Command Window:

```
ratio =
   15.8489
```

Problem 34

Script file:

```
clear, clc
L=2; v=5000; c=300*10^6;
delta=L*(1-sqrt(1-v^2/c^2))
```

Command Window:

```
delta =
   2.7778e-10
```

Problem 35

Script file:

```
clear, clc
format bank
%an interest rate of 10% is assumed
P=80000; n=5; r=.1;
bonus=P*(1+ r/365)^(365*n) - P*(1+ r)^n
```

Command Window:

```
bonus =
       3047.87
```

Problem 36

Script file:

```
clear, clc
```

```
%answer could be just decimal hours before 9:18 PM
T0=98.6; Ts=69; T1=79.5; T2=78; hr=9; min=18;
part=log((T1-Ts)/(T0-Ts))/log((T2-Ts)/(T0-Ts));
deltaT=part/(1-part);
t1=9+18/60;
t_death=t1-deltaT;
PM_hour_of_death=floor(t_death)
PM_min_of_death=round(60*(t_death-PM_hour_of_death))
```

Command Window:

```
PM_hour_of_death =
     2
PM_min_of_death =
    35
```

Problem 37

Script file:

```
clear, clc
sigma=12000; h=5; b=4; a=1.5;
K=sigma*sqrt(pi*a)*(1-a/(2*b)+0.326*(a/b)^2)/sqrt(1-a/b)
```

Command Window:

```
K =
   2.8283e+04
```

Problem 38

Script file:

```
clear, clc
disp('Part (a)')
t_minutes=log(2)/0.15
disp('Part (b)')
bigt_minutes=log(10^6/20)/0.15
```

Command Window:

```
Part (a)
t_minutes =
    4.6210


Part (b)
bigt_minutes =
   72.1319
```

Problem 39

Script file:

```
clear, clc
format rat
disp('Part (a)')
5/8+16/6
disp('Part (b)')
1/3-11/13+2.7^2
```

Command Window:

```
Part (a)
ans =
      79/24
Part (b)
ans =
    1247/184
```

Problem 40

Script file:

```
clear, clc
factorial_20=sqrt(2*pi*20)*(20/exp(1))^20
error=(factorial(20)-factorial_20)/factorial(20)
```

Command Window:

```
factorial_20 =
   2.4228e+18
error =
    0.0042
```