Scilab Textbook Companion for Algebra by P. Abbott And M. E. Wardle[1]

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Book Description

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Scilab numbering policy used in this document and the relation to the above book.

Exa Example (Solved example)

Eqn Equation (Particular equation of the above book)

AP Appendix to Example(Scilab Code that is an Appednix to a particular Example of the above book)

For example, Exa 3.51 means solved example 3.51 of this book. Sec 2.3 means a scilab code whose theory is explained in Section 2.3 of the book.

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Chapter 1

The meaning of algebra

Scilab code Exa 1.1 Conversion of pounds to pence

```
1
2 //ex1: no.of pence in x pounds added to y pence
3 clear;
4 clc;
5 close;
6 //' to express pounds in pence, multiply by 100'
7 x=poly(0,'x');
8 x_pounds=100*x; // x_pounds=100*x pence
9 mprintf(' total no. of pence =100x+y ')
```

Scilab code Exa 1.2 Distance car traveled

```
1
2 //ex2:car travels t h at v km/h.how far it go in 20
    min
3 clear;
4 clc;
5 close;
```

```
6 //'car goes  1*v km in 1h  2*v km in 2h  ...  t*v km
      in th'
7 x=20/60;
8 mprintf('\ncar travels %f*vkm in 20min',x)
```

Scilab code Exa 1.3 result in algebraic form

```
1
2 //ex3
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 y=poly(0,'y');
8 sum1=3*x+5;
9 divisor=4*y;
10 mprintf("result in algebraic form: \n(3*x+5)/(4*y)")
```

Chapter 2

Elementary Operations

Scilab code Exa 2.1 simplifying

```
1
2 //simplify 5a+6b+2a-3b
3 clear;
4 clc;
5 close;
6 //('collecting like terms \n');
7 x=5+2;y=6-3;
8 printf("total=%ia+%ib",x,y);
```

Scilab code Exa 2.2 Minimizing the terms

```
1
2 clear;
3 clc;
4 close;
5 //'collecting like terms ;
6 x=15+7;y=6-3;
7 printf("total=%ix+%iy-5",x,y)
```

Scilab code Exa 2.3 value of algebraic expression

```
1
2 //find value of 6x+2y-3x+4y-3 when x=3 & y=2
3 clear;
4 clc;
5 close;
6 x_coeff=6-3;y_coeff=2+4;
7 //"substitue given values"
8 x=3;y=2;
9 val=x_coeff*x + y_coeff*y -3
```

Scilab code Exa 2.4 Multiplication of powers of a number

```
1
2 clc;
3 clear;
4 close;
5 x=poly(0,'x');
6 p1=x^4;
7 p2=p1;
8 ex1_ans=p1*p2
9 a=poly(0,'a');
10 p1=2*a^7;
11 p2=a^3;
12 ex2_ans=p1*p2
13 b=poly(0,'b');
14 p1=5*b^2;
15 p2=3*b^5;
16 ex3_ans=p1*p2
17 //a^2*ab^2
18 ex4_ans=string('a^3b^3')
```

Scilab code Exa 2.5 Division of powers

```
1
2 //84a^6/12a^2
3 clear;
4 clc;
5 close;
6 a=poly(0,'a');
7 p1=84*a^6;
8 p2=12*a^2;
9 p=p1/p2;
10 horner(p,a)
```

Scilab code Exa 2.6 Algebraic division

```
1
2 //3x^4/6x^6
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 p1=3*x^4;
8 p2=6*x^6;
9 p=p1/p2
```

Scilab code Exa 2.7 Sum of terms

```
1
2 //x/3 + x/5
```

```
3  clear;
4  clc;
5  close;
6  x=poly(0,'x');
7  p1=x/3;
8  p2=x/5;
9  p=p1+p2;
10 q=8*x/15;
11 if(p==q)
12  mprintf("val=8*x/15 \n")
13 end
```

Scilab code Exa 2.8 Addition of algebraic terms

```
1
2  //sum of 3/a + 4/b
3  clear;
4  clc;
5  close;
6  val=string("(3b + 4a)/(ab)")
```

Scilab code Exa 2.9 Subtraction of terms

```
1
2  //x/y - a/b
3  clear;
4  clc;
5  close;
6  val=string('(bx-ay)/(by)')
```

Scilab code Exa 2.10 simplification of algebraic expression

```
1
2 //2a/15 + 5b/12
3 clear;
4 clc;
5 close;
6 d=int32([15,12]);//"L.C.M of denominators"
7 k=lcm(d);
8 a_coeff=60/15*2;
9 b_coeff=60/12*5;
10 disp('ans=')
11 mprintf("(%ia+%ib)/%i",a_coeff,b_coeff,k)
```

Scilab code Exa 2.11 Algebraic subtraction

```
1
2 //x/12a^2b - y/18ab^2
3 clear;
4 clc;
5 close;
6  d=int32([18,12]);//L.C.M of denominators
7 k=lcm(d);
8 //"L.C.M of a^2*b and a*b^2 is a^2*b^2"
9 x_coeff=36/12;
10 y_coeff=36/18;
11 disp('ans=')
12 mprintf("(%ibx-%iay)/%ia^2b^2",x_coeff,y_coeff,k)
```

Scilab code Exa 2.12 Division of terms

```
1
2 //4*x^3*y/(6*x*y^3)
```

```
clear;
clc;
close;
d=int32([4,6]);
m=4/gcd(d);
n=6/gcd(d);
x=poly(0,'x');y=poly(0,'y');
p1=x^3;p2=x;p=p1/p2;
q1=y;q2=y^3;q=q1/q2;
//val=m/n*p*q
disp('val=')
mprintf("%i/%i*x^2/y^2",m,n)
```

Scilab code Exa 2.13 Algebraic Multiplication

```
//6*a*x^4*2*y^3/(14*x^2*y^2*3*a^4)
clear;
clc;
close;
x=poly(0,'x');y=poly(0,'y');a=poly(0,'a');
num=6*2/(14*3);
p1=x^4;p2=x^2;p=p1/p2;
q1=y^3;q2=y^2;q=q1/q2;
r1=a;r2=a^4;r=r1/r2;
//val=num*p*q*r
disp('val=')
mprintf("%f*x^2*y/a^3",num)
```

Scilab code Exa 2.14 Division of algebraic terms

```
//(8x^3)/(5a^2y) *(3a)/(4x^2)
```

```
clear;
clc;
close;
x=poly(0,'x');y=poly(0,'y');a=poly(0,'a');
p1=x^3;p2=x^2;p=p1/p2;
q=1/y;
r1=a;r2=a^2;r=r1/r2;
num=8*3/(5*4);
//val=num*p*q*r
disp('val=')
mprintf("%f*x/(a*y)",num)
```

Chapter 3

Brackets and Operations with Them

Scilab code Exa 3.1 Multiplication of expressions within brackets

```
1
2
3 //simplify a(a^2+ab+b^2)
4 clear;
5 clc;
6 close;
7 val=string('a^3+(a^2)b+a(b^2)')
```

Scilab code Exa 3.2 Addition of expressions within brackets

```
1
2
3
4 //simplify 2(4a+3b)+6(2a-b)
5 clear;
6 clc;
```

```
7 close;
8 //b gets cancelled
9 val=string('20a')
```

Scilab code Exa 3.3 Subtraction of expressions within brackets

```
1
2 //simplify 5x-(5y+2x)
3 clear;
4 clc;
5 close;
6 //on adding like terms
7 val=string('3x-5y')
```

Scilab code Exa 3.4 Algebraic Difference

```
1
2 //simplify 3(4a-b)-2(3a-2b)
3 clear;
4 clc;
5 close;
6 //by removing braces
7 a_coeff=3*4-2*3;b_coeff=-3-2*-2;
8 mprintf("total=%ia+%ib\n",a_coeff,b_coeff);
```

Scilab code Exa 3.5 Substitution of values in algebraic expression

```
1
2 //x(2x-y)-x(x-y)-y(x+2y)
3 clear;
```

```
clc;
close;
disp("1)after simplifying")
val=string('x^2-x*y-2*y^2')
disp("2)after substituting given values")
x=2;y=1;
val=evstr(val)
```

Scilab code Exa 3.6 Systems of brackets

```

//simplify 2(3a+5(b+c))
clear;
clc;
close;
//by removing braces,
val=string('6a+10b+10c')
```

Scilab code Exa 3.7 Multiple brackets

```

//simplify 3(3a-2(a-b))
clear;
clc;
close;
//by removing braces,
a_coeff=3*3-3*2;b_coeff=3*2;
mprintf("total=%ia+%ib\n",a_coeff,b_coeff);
```

Scilab code Exa 3.8 Simplifying brackets

```
1
2 //simplify 12a-2[3a-(4-2(a-3))]
3 clear;
4 clc;
5 close;
6 a=poly(0,'a');
7 p=12*a-2*[3*a-{4-2*(a-3)}]
```

Chapter 4

Positive and Negative numbers

Scilab code Exa 4.1 Subtraction

```
1
2 clear;
3 clc;
4 close;
5 disp("subtraction")
6 x=poly(0,'x');
7 b=poly(0,'b');
8 val1=5*x-(-3*x)
9 val2=-2*b-(-4*b)
```

Chapter 5

Expressions and Equations

Scilab code Exa 5.1 Nth term of the sequence

```
1
2 clc;
3 clear;
4 close;
5 //46ex
6 //nth term in the sequence 2,4,6,8,10...is 2n. 5th
     term is?
7 term5=2*5
8 //nth term in the sequence 1,4,9,16,25 is n^2. 5th
     term is?
9 ex2_term5=5^2
```

Scilab code Exa 5.2.a Using function machines

```
1
2 // 5,8,11,14,17.....
3 clear;
4 clc;
```

```
close;
a=5;//a is starting number of the series
n=5;//given n=5
d=3;//difference between the numbers
td=a+(n-1)*d; //formula to be used for arithmetic
   series
mprintf("ans= %i",td)
```

Scilab code Exa 5.2.b Value substitution in function machine

```

// 9,12,15,18,21.....
clear;
clc;
close;
a=9;//a is starting number of the series
n=5;//given n=5
d=3;//difference between the numbers
td=a+(n-1)*d;//formula to be used for arithmetic
   series
mprintf("ans= %i",td)
```

Scilab code Exa 5.3.a substitution in function machine

```

// 5,12,19,26,33.....
clear;
clc;
close;
a=5;//a is starting number of the series
n=5;//given n=5
d=7;//difference between the numbers
```

```
9  td=a+(n-1)*d; //formula to be used for arithmetic
       series
10 mprintf("result= %i",td)
```

Scilab code Exa 5.3.b Square and add

```
1
2  // 3,6,11,18,27.....
3  clear;
4  clc;
5  close;
6  n=5;
7  td=n^2+2;
8  mprintf("result= %i",td)
```

Scilab code Exa 5.4.a Terms of the sequence

```
1
2  // 5n-2
3  clear;
4  clc;
5  close;
6  mprintf("the first five terms of the sequence are: \
       n");
7  for n=1:5
8    disp(5*n-2)
9   end
```

Scilab code Exa 5.4.b sequence

```
1
2 //draw function machine for 4(n+5)
3 clear;
4 clc;
5 close;
6 mprintf("the first five terms of the sequence are: \
    n");
7 for n=1:5
8   disp(4*(n+5))
9  end
```

Scilab code Exa 5.4.c First 5 terms of the sequence

```
1
2 //draw function machine for n^2+5
3 clear;
4 clc;
5 close;
6 mprintf("the first five terms of the sequence are: \
    n");
7 for n=1:5
8   disp(n^2+5)
9  end
```

Scilab code Exa 5.5.a Sequence terms

```
1
2 // 4(5n-2)
3 clear;
4 clc;
5 close;
6 mprintf("the first five terms of the sequence are: \
    n");
```

```
7 for n=1:5
8   disp(4*(5*n-2))
9  end
```

Scilab code Exa 5.5.b First 5 terms

```
1
2 // 4(n+5)+3
3 clear;
4 clc;
5 close;
6 mprintf("the first five terms of the sequence are: \
    n");
7 for n=1:5
8   disp(4*(n+5)+3)
9  end
```

Scilab code Exa 5.5.c evaluate the expression

```
1
2 // 2(n^2+5)
3 clear;
4 clc;
5 close;
6 mprintf("the first five terms of the sequence are: \
    n");
7 for n=1:5
8   disp(2*(n^2+5))
9  end
```

Scilab code Exa 5.6.a drawing function machine

```
1
2 //evaluate 2*(3*n^2+5)-4
3 clear;
4 clc;
5 close;
6  n=7; //given
7 disp('ans=')
8  disp(2*(3*n^2+5)-4)
```

Scilab code Exa 5.6.b simplifying by removing brackets

```
1
2 //evaluate 2*(3*n^2+5)-4 by removing brackets
3 clear;
4 clc;
5 close;
6 n=poly(0,'n');
7 p1=2*(3*n^2+5)-4;//removing braces
8 n=7;//given
9 val=2*(3*n^2+5)-4
```

Scilab code Exa 5.7.a Composite rule fg

```
1
2 //f(x):x->3x;g(x):x->x-2;fg(5)
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 f=3*x;
8 g=x-2;
```

```
9  //  fg= f(g(x))=f(x-2)=3*(x-2)
10 x=5;
11 fg=3*(x-2)
```

Scilab code Exa 5.7.b Composite rule gf

```
1
2  //f(x):x->x+3;g(x):x->x^2; gf(5)
3  clear;
4  clc;
5  close;
6  x=poly(0,'x');
7  f=x+3;
8  g=x^2;
9  //  gf= g(f(x))=g(x+3)=(x+3)^2
10 x=5;
11 gf=(x+3)^2
```

Scilab code Exa 5.8 Inverse of the rule

```
1
2  //inverse of x->3x+4
3  clear;
4  clc;
5  close;
6  x=poly(0,'x');
7  p1=3*x+4;
8  disp(p1,"x->")
9  mprintf("inverse of the rule is:\n (x-4)/3")
```

Scilab code Exa 5.9 Inverse

```
1
2 //inverse of x->3(x+4)-2
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 mprintf("1)inverse of the rule is:\n (x+2)/3-4 \n ")
    ;
8 x=6;//given
9 x=3*(x+4)-2;
10 mprintf("2)");
11 inv_val=(x+2)/3-4
```

Scilab code Exa 5.10 Substitute number in the rule

```
1
2 clear;
3 clc;
4 close;
5 for x=1:20
6   if(3*x+4==19)
7     mprintf("the number which gives 19 as result is
        %i",x)
8   end
9   end
```

Scilab code Exa 5.11 Finding x

```
1
2 clear;
3 clc;
```

```
4  close;
5  for x=1:10
6    if(5*x-7==8)
7      mprintf("the value of x is %i\n",x)
8      break
9    end
10 end
```

Scilab code Exa 5.12 Value of x

```
1
2  clear;
3  clc;
4  close;
5  for x=1:20
6    if(5*(x-3)==20)
7      mprintf("the value of x is %i \n",x)
8      break
9    end
10 end
```

Scilab code Exa 5.13 Finding n

```
1
2  clear;
3  clc;
4  close;
5  for n=1:60
6    if(3*(2*n-5)+4==55)
7      mprintf("the value of n is %i \n",n)
8      break
9    end
10 end
```

Chapter 6

Linear Equations

Scilab code Exa 6.1 Solving an equation

```
1
2 //8 times a number is decreased by 5 the result is
     123
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 //let x be the number
8 expr=8*x-5;
9 for x=1:100
10   if((8*x-5)==123)
11     mprintf("the number is %i",x)
12   end
13   end
```

Scilab code Exa 6.2 Finding 3 consecutive odd numbers

```
1
```

```
2 //sum of 3 consecutive odd no.'s is 81
3 clear;
4 clc;
5 close;
6 //let the 3 consecutive odd numbers be 2n+1,2n+3,2n
    +5
7 n=poly(0,'n');
8 expr=(2*n+1)+(2*n+3)+(2*n+5);
9 for n=1:100
10   if((2*n+1)+(2*n+3)+(2*n+5)==81)
11     //mprintf("n=%i \n",n);
12     break
13   end
14 end
15 n1=2*n+1;
16 n2=2*n+3;
17 n3=2*n+5;
18 mprintf("\n the numbers are %i ,%i, %i\n",n1,n2,n3)
```

Scilab code Exa 6.3 Solving the equation

```
1
2 clear;
3 clc;
4 close;
5 x=poly(0,'x');
6 p1=(6*x-5);
7 p2=(2*x+9);
8 p3=p1-p2;
9 x=roots(p3)
10 left=6*x-5; //check by substituion
11 right=2*x+9;
12 if(left==right)
13   mprintf("satisfies the equation \n")
14 end
```

Scilab code Exa 6.4 Solve equation

```
1
2 clear;
3 clc;
4 close;
5 x=poly(0,'x');
6 p1=10*(x-4);
7 p2=4*(2*x-1)+5;
8 p3=p1-p2;
9 x=roots(p3);
10 left=10*(x-4);//substitution
11 right=4*(2*x-1)+5;
12 if(left==right)
13   format(5)
14 x
15 end
```

Scilab code Exa 6.5 Equating 2 expressions

```
1
2 clear;
3 clc;
4 close;
5 x=poly(0,'x');
6 p1=3*x/5+x/2;
7 p2=5*x/4-3;
8 p3=p1-p2;
9 x=roots(p3) //by the law of signs
```

Scilab code Exa 6.6 equation solution

```
1
2 clear;
3 clc;
4 close;
5 x=poly(0,'x');
6 p1=4*x-(x-2)/3;
7 p2=5+(2*x+1)/4;
8 p3=p1-p2;
9 x=roots(p3)
10 left=4*x-(x-2)/3;//substitution
11 right=5+(2*x+1)/4;
12 if(left==right)
13 mprintf("satisfies the equation \n")
14 end
```

Scilab code Exa 6.7 Number of men and women at dance party

```
1 clear;
2 clc;
3 close;
4 x=poly(0,'x');
5 //let x be the number of men.then, x+10 is no. of
    women as per given data
6 money_paid_by_men=20*x;
7 money_paid_by_women=15*x + 10;
8 total=1620
9 expr=8*x-5;
10 for x=1:100
11   if((20*x + 15*(x + 10))==1620)
12     mprintf("the number of  men is %i \n",x)
13     mprintf("the number of women is  %i",x+10)
14   end
15 end
```

Scilab code Exa 6.8 Finding the distance

```
clear;
clc;
close;
x=poly(0,'x');
//let x be distance in kilometers
time_1st_journey=x/64
time_2nd_journey=x/80
total_time=9;
for x=1:500
  if((x/64 + x/80) == 9)
    mprintf("the value of  x is %iKm \n",x)
   end
end
```

Scilab code Exa 6.9 Finding the weekly increase

```
clear;
clc;
close;
x=poly(0,'x');
//let x be amount of increase in pence
mans_new_wage=480+x;
womens_new_wage=370+x;
for x=1:500
  if((480+x) == (6*(370+x)/5))//by given data
    mprintf("the weekly increase is %ip \n",x)
   end
end
```

Chapter 7

Formulae

Scilab code Exa 7.1 Area of pyramid

```
1
2 //total area(A) of the surface of a square pyramid
3 clear;
4 clc;
5 close;
6 //AB=a , OQ=d
7 //OQ is perpendicular to AB. Represents height of
    trianlge AOB
8 tot_area=string('base_area + triangles_area')
9 //base_area=a^2. triangles_area=4*(a*d)/2
10 A=string('a(a+2d)')
```

Scilab code Exa 7.2 Finding L

```
1
2 //L=W(T-t)/w - t
3 clear;
4 clc;
```

```
5 close;
6 W=380;T=28.5;t=8.5;w=115;//given
7 L=string('(W*(T-t)/w)-t');
8 disp("substituting given values")
9 L=evstr(L)
```

Scilab code Exa 7.3 Finding f and d terms

```
1
2 //T=%pi*f*d^3/16
3 clear;
4 clc;
5 close;
6 disp(" (1) f in terms of other quantities is")
7 f=string('16*T/(%pi*d^3)')
8 disp("(2)  d in terms of other quantities is ")
9 d=string('(16*T/(%pi*f))^(1/3)')
```

Scilab code Exa 7.4 Transform L

```
1
2 //transform L=l+(8*d^2)/(3*l)
3 clear;
4 clc;
5 close;
6 disp(" d in terms of other quantities is")
7 //3*l*L=3*l^2+8*d^2
8 d=string('sqrt((3*l*L-3*L^2)/8)')
```

Scilab code Exa 7.5 Finding velocity from equation

```
1
2 //the velocity ,V, of water flowing through a pipe,
     occurs in the formula ,h=0.03*L*V^2/(D*2*g)
3 clear;
4 clc;
5 close;
6 disp("changing the subject of formula to V")
7 //V^2/(2*g)=H*d/(0.03*L)
8 V=string('sqrt(2*g*h*D/(0.03*L))')
```

Scilab code Exa 7.6 Finding n

```
1
2 //a-b=x*(c-n*d)
3 clear;
4 clc;
5 close;
6 disp('n in terms of other quantities is')
7 //n*d=c-(a-b)/x
8 n=string('{c-(a-b)/x}/d')
```

Scilab code Exa 7.7 Length of pendulum

```
1
2 //time of vibration of a simple pendulum is given by
     the formula ,t=2*%pi*sqrt(l/g)
3 clear;
4 clc;
5 close;
6 disp('l in terms of other quantities is')
7 //t^2*g=4*%pi^2*l
8 l=string('g*t^2/4*%pi^2')
```

Scilab code Exa 7.8 Solving the equation

```
1
2 //solve 5*x-a=2*x-b
3 clear;
4 clc;
5 close;
6 //collecting like terms to one side
7 x=poly(0,'x');
8 p=5*x-2*x;//Also, p=a-b
9 x=string('(a-b)/3')
```

Scilab code Exa 7.9 Solving x

```
1
2 //solve for x, a*(x-2)=5*x-(a+b)
3 clear;
4 clc;
5 close;
6 //removing brackets. "a*x-5*x=a-b"
7 x=string('(a-b)/(a-5)')
```

Chapter 8

Simultaneous Equations

Scilab code Exa 8.1 Solving the eqautions

```
1
2 //2x+y=21, 3x+4y=44
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 y=21-2*x;          //equation 1
8 y=(44-3*x)/4;      //equation 2
9 for x=1:20
10   if(21-2*x==(44-3*x)/4)
11     mprintf(" the solution is :\n x=%i \n ",x)
12     break
13   end
14 end
15 //"substitute the x value in any one of the above
     equations"
16 y=21-2*x;mprintf(" y=%i \n",y)
```

Scilab code Exa 8.2 Finding x and y values from equation

```
1
2 //x+y=15,3x-y=21
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 y=15-x;        //equation 1
8 Y=3*x-21;      //equation 2
9 disp("the solution is ");
10 p2=y-Y;
11 x=roots(p2)
12 //substitute x value in equation 1
13 y=15-x
```

Scilab code Exa 8.3 Solving the equation

```
1
2 //2x+3y=42, 5x-y=20
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 y=(42-2*x)/3;   //equation 1
8 y=5*x-20;       //equation 2
9 for x=1:20
10   if((42-2*x)/3==5*x-20)
11     mprintf("x=%i  ",x)
12     break
13   end
14 end
15 //substitute the x value in any one of the above
    equations
16 y=5*x-20;mprintf("y=%i",y)
17 printf("\n the solution is : \n");
18 [x y]
```

Scilab code Exa 8.4 Finding R1 and R2

```
1
2 //0.5R1+1.2R2=1.486,4.5R1-2R2=4.67
3 clear;
4 clc;
5 close;
6 R2=poly(0,'R2');
7 R1=(1.486-1.2*R2)/0.5;
8 R=(4.67+2*R2)/4.5;
9 P=R1-R;
10 printf("THE SOLUTION IS: \n");
11 R2=roots(P)
12 //SUBSTITUTE IN THE EQUATION
13 R1=(1.486-1.2*R2)/0.5
```

Scilab code Exa 8.5 numbers of simultaneous equations

```
1
2 //ex1
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 //sum of first no.(i.e., x) and 3 times the second
     no.(i.e., y) is 53 =>x+3*y=53
8 y=(53-x)/3;
9 //difference between 4 times the first and twice the
     2nd is 2 => 4x-2y=2
10 y=(4*x-2)/2;
11 printf("the solution is : \n");
```

```
for x=1:100
  if((53-x)/3==(4*x-2)/2)
    mprintf("x=%i",x)
    break
  end
end
//"substitute the x value in any one of the above
   equations"
y=(53-x)/3;mprintf("y=%i",y)
```

Scilab code Exa 8.6 Values of m and b

```

//y=mx+b
//given x=4,y=6  and  x=2.4,y=4.5
clear;
clc;
close;
m=poly(0,'m');
b=6-4*m; //(equation 1) when x=4,y=6
B=4.5-2.4*m;//(equation 2) when x=2.4,y=4.5
P=b-B;
disp("the solution is :");
m=roots(P)
//substitute this value
b=6-4*m
//"substitute these values in the equation y=mx+b"
x=poly(0,'x');
y=m*x+b
```

Scilab code Exa 8.7 total books sold and books sold at 25p

```

```

```
2  //ex3
3  clear;
4  clc;
5  close;
6  //let x=number originally sold at 25p
7  //let y=number originally sold at 20p
8  //amounts received for these were 25x pence and 20y
       pence & their total value was 1100pence =>25x+20y
       =1100
9  x=poly(0,'x');
10 y=(1100-25*x)/20;
11 //when the no.s are reversed he receives 20x and 25
       ypence ans their total value is 1150 pence =>20x
       +25y=1150
12 y=(1150-20*x)/25;
13 for x=1:100
14   if((1100-25*x)/20==(1150-20*x)/25)
15         break
16   end
17 end
18 //"substitute the x value in any one of the above
       equations"
19 y=(1100-25*x)/20;
20 mprintf("the total no. of books sold was %i \n ",x+y
       )
21 mprintf("the number originally sold at 25p was %i",x
       );
```

Chapter 9

Linear Inequalities

Scilab code Exa 9.1.a Inequality of n less than 3 on 0 to 10 number line

```
1
2 //n<3
3 clear;
4 clc;
5 close;
6 x=string(0:10);
7     n=string( '<'+strcat(x,'---')+'>'); //0 to 10 no
        . line
8
9       strsubst(n,'0---1---2---','------------')
10
11     disp('the  SOLID LINE specifies region n<3')
```

Scilab code Exa 9.1.b Inequality of n greater than or equal to 6 on 0 to 10 number line

```
1
2 //n>=6
```

```
3  clear;
4  clc;
5  close;
6  x=string(0:10);
7        n=string('<'+strcat(x,'---')+'>');  //0 to 10
           no. line
8
9        n1=strsubst(n,'6---7---8---9---10','
           ------------------');
10
11     mprintf("\n the number line  \n \n %s represents
         n>=6 ",n1)
```

Scilab code Exa 9.1.c Inequality of n between 2 and 5 on 0 to 10 number line

```
1
2  //2<n<=5
3  clear;
4  clc;
5  close;
6  x=string(0:10);
7      n=string('<'+strcat(x,'---')+'>');  //0 to 10 no
         . line
8
9          n1=strsubst(n,'---3---4---5','-----------'
             );
10
11         mprintf("\n the number line  \n \n %s
             represents 2<n<=5 ",n1)
```

Scilab code Exa 9.2.a Number line representing inequality of n greater than 7

```
1
2 //what inequality is represented on no. line
3 clear;
4 clc;
5 close;
6 x=string(0:10);
7     n=string('<'+strcat(x,'---')+'>'); //0 to 10 no.
        line
8
9    n1=string(strsubst(n,'---8---9---10','
       ---------------'));
10
11 mprintf("\n the number line  \n %s represents n>7 ",
   n1)
```

Scilab code Exa 9.2.b Number line representing n less than or equal to3

```
1
2 //what inequality is represented on no. line
3 clear;
4 clc;
5 close;
6 x=string(0:10);
7     n=string('<'+strcat(x,'---')+'>');  //0 to 10 no
        . line
8
9     n1=string(strsubst(n,'0---1---2---3','
        -------------'));
10
11 mprintf("\n the number line  \n %s represents n1<=3
   ",n1)
```

Scilab code Exa 9.2.c Representing inequality on number line

```
1
2 //what inequality is represented on no. line
3 clear;
4 clc;
5 close;
6 x=string(0:10);
7     n=string('<'+strcat(x,'---')+'>');  //0 to 10 no
        . line
8
9     n1=string(strsubst(n,'5---6---7---','
        ------------'));
10
11 mprintf("\n  the number line \n \n  %s represents
    5<=n1<8",n1)
```

Scilab code Exa 9.3 Solving the inequality

```
1
2 //3x-5<2x+8
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 p1=(3*x-5);
8 p2=(2*x+8);
9 //p1-p2<0
10 disp("<0",p1-p2)
11 mprintf("i.e., x<13 is the solution for those values
    of x which are < 13")
```

Scilab code Exa 9.4 Solving the greater than inequality

```
1
```

```
2 //3x+5>5x-9
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 p1=(3*x+5);
8 p2=(5*x-9);
9 //p1-p2>0
10 disp(">0",(p1-p2)/2)
11 mprintf("i.e., x<7 is the solution for those values
     of x which are < 7")
```

Scilab code Exa 9.5 Solving the greater than or equal to inequality

```
1
2 //2(3x+5)+1>=(4x-9)
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 p1=2*(3*x+5)+1;
8 p2=(4*x-9);
9 //p1-p2>=0
10 disp(">=0",(p1-p2)/2)
11 mprintf("\n i.e.,  x>=-10 is the solution for those
     values of x which are >= 10")
```

Scilab code Exa 9.6 Solving the less than inequality

```
1
2 //8/x<2
3 clear;
4 clc;
```

```
5 close;
6 // x is any no. greater than 4 and x can also be a
     negative no.
7 mprintf("8<2*x or x>4 is the solution if x is
     positive no.")
8
9 disp("if x were neagative,then the inequality would
     become 8>2*x ")
```

Scilab code Exa 9.7 Satisfying both the inequalities

```
1
2 //find x which satisfies 3*x+2>8 & 5*x-3<27
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 for x=1:100
8   if(3*x+2>8)
9       mprintf("x>%i\n\nand",x)//solving the first we
            get
10       break
11   end
12 end
13 x=1;
14 while(5*x-3<27)  //on  solving the second we get
15   x=x+1;
16   continue
17 end
18 mprintf("x<%i \n",x);
19 x=string(0:10);
20 n=string('<'+strcat(x,'---')+'>');//0 to 10 no. line
21 n1=strsubst(n,'---4---5---','-----------');
22 mprintf('the solid line in the number line  \n %s
     represents 3<x<6 ",n1)
```

Scilab code Exa 9.8 Finding positive values in inequalities

```
1
2 //find x which satisfies 3*(x+5)>8*x & 5*(x-3)<27-x
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 x=1;
8 while(3*(x+5)>8*x)
9   x=x+1;
10  continue
11 end
12 mprintf("\n x<%i\n\nand",x)
13 while(5*(x-3)+x<27)  //on  solving the second we get
14   x=x+1;
15   continue
16 end
17 mprintf("x<%i \n",x)
18 x=string(0:10);
19 n=string('<'+strcat(x,'---')+'>');  //-2 to 8 no.
     line
20 n1=strsubst(n,'0---1---2---','------------');
21 mprintf('the  SOLID LINE specifies final region 0<=x
     <3 \n %s',n1)
```

Scilab code Exa 9.9 Value of x satisfying the given inequalities

```
1
2 //2<x<7 & 4<x<9
3 clear;
```

```
clc;
close;
x=string(0:10);
n=string('<'+strcat(x,'---')+'>');  //0 to 10 no.
   line
    n1=strsubst(n,'---3---4---5---6---','
       -------------------');  //2<x<7
    n2=strsubst(n,'---5---6---7---8---','
       -------------------');  //4<x<9
    n3=strsubst(n,'---5---6---','------------');
mprintf('the  inequality which satisfies both
   inequalities\n2<x<7 \t%s\n\n4<x<9\t%s\nis\n4<x<7\
   t%s',n1,n2,n3)
```

Scilab code Exa 9.10 Values satisfying the inequalities

```
//-2<x<=3 & -1<x<=5
clear;
clc;
close;
x=string(-2:6);
     n=string('<'+strcat(x,'~~~')+'>');  //0 to 10
        no. line

     n1= strsubst(n,'~~~-1~~~0~~~1~~~2~~~3','
        ----------------------');   //-2<x<=3
     n2= strsubst(n,'~~~0~~~1~~~2~~~3~~~4~~~5','
        ------------------------');   //-1<x<=5


    n3=  strsubst(n,'~~~0~~~1~~~2~~~3','
       ----------------');
```

```
16      mprintf('the inequality which satisfies both
            inequalities\n-2<x<=3 \t%s\n\n-1<x<=5\t\t%s\
            nis\n-1<x<=3\t\t%s',n1,n2,n3)
```

Chapter 10

Graphical representation of Quantities

Scilab code Exa 10.1 Annual premiums charged at various ages

```
1
2 clear;
3 clc;
4 close ;
5 clf;
6 AGE=[25  30  35  40  45  50];
7 premium_in_$=[2.33 2.59 2.91 3.31 3.81 4.53];
8 plot(AGE,premium_in_$,3);
9 xtitle("Annual Premiums charged by an insurance
    company","AGE(in years)","premium_in_$");
10 xgrid;
11 AGE=43;premium_in_$=3.6;plot(AGE,premium_in_$,'r.
    diam');
12 AGE=36;premium_in_$=3;plot(AGE,premium_in_$,'r.diam'
    );
13 plot(25,2.0,'o')
```

Scilab code Exa 10.2 Resistance for given length of wires

```
1
2 clear;
3 clc;
4 close;
5 clf;
6 length1=[100 120 170 220];
7 resistance=[2.5 3 4.25 5.5];
8 plot(length1,resistance,'b--.diam')
9 xtitle("Relation between Resistances and Length","
    length_in_meters","resistance_in_ohms");
10 xgrid;
11 length1=200;
12 resistance=5;
13 plot('length','resistance','b.diam')
14 plot(250,6.21,'b.diam')//this point is called
    extrapolation
```

Scilab code Exa 10.3 to show the relation between time and distance

```
1
2 clear;
3 clc;
4 close;
5 clf;
6 time=[0 1 2 3 4 5];
7 distance=[0 2 8 18 32 50];
8 plot(time,distance,"o-")
9 xtitle("Relation between Time and Distance","time t
    in sec","distance in meters");
10 xgrid;
11 //ex1:distance passed over in 3.6s
12 mprintf("EX1: \nfrom curve, it is 26m. the actual
    distance from formula is 25.92m")
```

```
13 //ex2:time to travel 42m
14 mprintf("EX2: \nline from 42m on distance axis that
     touches the curve at 4.6s.the mechanics formula
     gives 4.58s")
```

Chapter 11

The law of a straight line

Scilab code Exa 11.1 Connection between net profit and number of customers

```
1
2 clear;
3 clc;
4 close;
5 //x-no. of customers.  b-the expenses
6 clf;
7 cust=[230 240 270 300 350 380];
8 profit=[0 0.5 2.0 3.5 6.0 7.5];
9 plot(cust,profit,6);
10 plot(230,0,'r->.diam');
11 //profit(y) depends on varying no. of customers(x).
12 xtitle("the straight line graph","no. of customers",
     "profit");
13 xgrid();
14 //ex(1)
15 mprintf("(1) From graph, if x=230, then y=0");
16 //ex(2)
17 mprintf("(2) if no. of customers is <230 then there
     will be a loss")
```

Scilab code Exa 11.2 The law represented by a straight line graph

```
1
2 clear;
3 clc;
4 close;
5 //let a-the avg. amount paid. x-no. of customers.  b
    -the expenses
6 //net profit is y=ax-b
7 x=320;y=4.50;
8 x=250;y=1.00;
9 //substitute in above equation
10 //4.5=320*a-b-equ.1;1=250*a-b-equ.2.subbstract equ.2
    from 1.
11 a=0.05;//we get
12 b=250*a-1;
13 x=poly(0,'x');
14 y=a*x-b;//equation to straight line
15 //if there is no profit i.e., y=0
16 for x=1:500
17 if(0.05*x-11.5==0)
18 mprintf("x=%i \n",x)
19 break
20 end
21 end
22 clf;
23 cust=[230 240 270 300 350 380];
24 profit=[0 0.5 2.0 3.5 6.0 7.5];
25 plot(cust,profit,6);
26 plot(230,0,'r->.diam');
27 //profit(y) depends on varying no. of customers(x).
    the no.'s 0.05 & 11.5 remained constant
28 xtitle("the straight line graph","no. of customers",
    "profit");
```

```
29 legend("y=0.05*x-11.5");
30 xgrid();
```

Scilab code Exa 11.3 Graph of the given equation

```
1
2 //2*y-4*x=3
3
4 clear;
5 clc;
6 close;
7 x=poly(0,'x');
8 x=[-2 -1 0 1 1.8 2];
9 y=(3+4*x)/2;
10 x_vs_y=[x;y];
11 plot(x,y,3)
12 plot(0,1.5,'r.->')//when x=0. 1.5 is intercept on y-
   axis
13 plot(-0.75,0,'r.->')//when y=0. -0.75 is intercept
   on x-axis
14 xtitle("graph of equation 2y-4x-3","x axis","y axis"
   );
15 xgrid;
```

Scilab code Exa 11.4 Graph of the equation

```
1
2 //2*x+y=1
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 x=[-2 -1 0 1 2 3];
```

```
y=1-2*x;
x_vs_y=[x;y];
plot(x,y,3)
plot(0,1,'r.->')// intercept on y-axis
plot(0.5,0,'r.->')// intercept on x-axis
xtitle("graph of the equation 2x+y=1","x axis","y
    axis");
xgrid;
```

Scilab code Exa 11.5 Graphs of straight lines not passing through origins

```

//y=mx+b
clear;
clc;
close;
clf;
x=linspace(0,3,4);
y=x;
plot2d(x,y,1);
y=x+2;
plot2d(x,y,4);
y=x-3;
plot2d(x,y,5);
xtitle("Equations of the form y=mx+b","x axis","y
    axis");
legend("y=x","y=x+2","y=x-3",2);
//m is constant, b is fixed distance. (x,y) vary for
    different points on the line
xgrid()
//ex(1)
mprintf("ex(1) In y=4x-7, gradient is 4.Intercept on
    y-axis is -7")
//ex(2)
mprintf("ex(2) In y=0.05x-11.5, gradient is 0.05 and
```

```
    intercept on y-axis is -11.5")
```

Scilab code Exa 11.6 Graphical solution of simultaneous equations

```
1
2  //x+2*y=5,  3*x-2*y=7
3  clear;
4  clc;
5  close;
6  x=poly(0,'x');
7  //graph of x+2*y=5
8  x=[0 -1 2 5];
9  y=(5-x)/2;
10 x_vs_y=[x;y];
11 plot(x,y,'b--.x')
12 //graph of 3*x-2*y=7
13 x=[0 -1 7/8 4];
14 y=(3*x-7)/2;
15 plot(x,y,'b--.o')
16 for x=1:100
17   if((5-x)/2==(3*x-7)/2)
18     break
19   end
20 end
21 mprintf("the solution of the equation is")
22 y=(5-x)/2;
23 mprintf("x=%i\ny=%i ",x,y)
24 plot(x,y,'r.->')
25 xtitle("graph of simultaneous equations","x axis","y
       axis");
26 xgrid;
27 legend("x+2*y=5","3*x-2*y=7",4);
```

Chapter 12

Using inequalities to define regions

Scilab code Exa 12.1 Graph the region described by inequalities

```
1
2 //Given : inequalities y>x and y<2*x-3
3 clc;
4 clear;
5 clf();
6 x=linspace(0,8,8);
7 y=2*x-3;//"points in the region y<2*x-3 lie below
     the line y=2*x-3"
8 plot(x,y,"o-");
9 y=x;//"points in the region y>x lie above the line y
    =x"
10 plot(x,y,"+-");
11 x=5;y=6;plot(x,y,'r.diam')//point that lies in the
     region
12 xtitle("region described by inequalities","x axis","
     y axis");
13 legend("2*x-3","x");
14 xgrid;
```

Scilab code Exa 12.2 Finding one point in the region described by inequalities

```
1
2 //Given :Inequalities y>x-2, y<2*x+1 and x+y<6
3 clc;
4 clear;
5 clf();
6 x=linspace(0,9,10);
7 y=x-2;
8 plot2d(x,y,3);//"points in the region y>x-2 lie
     above the line y=x-2"
9 y=2*x+1;
10 plot2d(x,y,5);//"points in the region y<2*x+1 lie
     below the line y=2*x+1"
11 y=6-x;
12 plot2d(x,y,2);//"points in the region x+y<6 lie
     below the line x+y=6"
13 xtitle("region dscribed by inequalities","x axis","y
     axis");
14 legend("x-2","2*x+1","6-x",2);
15 xgrid;
16 //(3,2) is one point from the graph enclosed by
     these inequalities
17 x=3;y=2;plot(x,y,'b.diam')
18 if((y>x-2)&(y<2*x+1)&(x+y<6))  //this condition does
     not satisfies the point that lies out of the
     region ex:(7,7)
19  mprintf('\n point that lies in the region is (%i,%i
     ) \n',x,y)
20 end
```

Scilab code Exa 12.3 Greatest and least values in the region

```
1
2 //Given  :Inequalities x+3*y<=24, 3*x+y<21.
3 clc;
4 clear;
5 clf();
6 x=linspace(0,9,10);
7 y=21-3*x;
8 plot2d(x,y,3); //"points in the region y<21-3*x lie
     below the line y=21-3*x"
9 y=(24-x)/3;
10 plot2d(x,y,5);//"points in the region y<=(24-x)/3
     lie below or on the line y=(24-x)/3"
11 xtitle("greatest values in a region","x axis","y
     axis");
12 xgrid;
13 printf(" \n from graph, (3,7),(4,6),(5,5) are points
      where x+y is largest \n")
14 y=10-x;//3+7=10,4+6=10,5+5=10 so, all the points lie
      on the line x+y=10
15 x=3;y=7;plot(x,y,'b.diam')
16 x=4;y=6;plot(x,y,'b.diam')
17 x=5;y=5;plot(x,y,'b.diam')
18 //"points on the line 3*x+y<21 are not included
     since we want 3*x+y<21 and not 3*x+y<=21"
19 legend("3*x+y<21","x+3*y<=24","10-x");
```

Scilab code Exa 12.4 Finding maximum profit with linear programming

```
1
2 //Given: For model A, material(m) cost(c)=4$,labour(
     l) 5$,profit(p) 5$.For model B, m=3$, l=9$,p=6$.
     Altogether 240$ for m and 450$ for l.
3 clc;
```

```
4  clear;
5  clf();
6  //let a is number of model A and b for model B to be
       made
7  //constraints on m & l as pair of ineqalities 4a+3b
       <=240,5a+9b<=450.maximize the profit 5a+6b
8  a=linspace(1,100,10);
9  b=(240-4*a)/3;
10 plot2d(a,b,3);
11 b=(450-5*a)/9;
12 plot2d(a,b,5);
13 //find the point in this region where 5a+6b is
       greatest with the parallel lines concept
14 //consider the parallel lines 5a+6b=100 , 5a+6b=150
       , 5a+6b=300 ... the 2nd two are shown on graph \n
       ");
15 b=(150-6*a)/5;
16 plot(a,b,'b--.x');
17 b=(300-6*a)/5;
18 plot(a,b,'b--.o');
19 // as profit gets larger, profit line moves up to
       the right
20 a=39;b=28;
21 m=5*a+6*b;
22 mprintf('\n the maximimum profit %i occurs at (%i,%i
       ) \n',m,a,b);
23 xtitle("Model A vs. Model B ","Model A","Model B");
24 xgrid;
25 legend("4a+3b<=240","5a+9b<=450","5a+6b=150","5a+6b
       =300");
```

Scilab code Exa 12.5 Minimum cost of feed

```
1
2  //Given : vitamin A-8units ,B-6units, C- 3units and
```

```
    the cost of making composite feed is 120*x+90*y (
    costs of each feed per kg.are 120p &90p)
clc;
clear;
clf();
v=[1 3 1;4 1 1];//rows-feed 1,feed 2 and columns-
    vitamins A,B,C. vitamin content of each feed per
    kilogram
// A:x+4*y>=8; B:3*x+y>=6; C:x+y>=3. min_cost=120*
    x+90*y
x=linspace(0,10,10);
y=6-3*x;plot2d(x,y,3);
y=(8-x)/4;plot2d(x,y,6);
y=3-x;plot2d(x,y,5);
//the 2 cost lines for 360p and 720p are shown in
    the graph as dotted lines
// assume 2 parallel lines 120*x+90*y=360 , 120*x
    +90*y=720
y=(360-120*x)/90;plot(x,y,'b--.x');
y=(720-120*x)/90;plot(x,y,'b--.o');
//lines move down to left as cost decreases.min cost
     occurs at last line that contains atleast 1
    point in the required region
x=1;y=3;
min_cost=120*x+90*y;
mprintf("\n minimum cost %i occurs at (%i,%i)",
    min_cost,x,y);
xtitle("Feed1 vs. Feed 2","Feed 1","Feed 2");
legend("3*x+y>=6","x+4*y>=8","x+y>=3","120*x+90*y
    =360","120*x+90*y=720");
xgrid;
```

Chapter 13

Multiplication of algebraic expressions

Scilab code Exa 13.1 Product of binomial expressions

```
1
2  clc;
3  clear;
4  close;
5  x=poly(0,'x');
6  p=(x+6)*(x+5)
7  a=poly(0,'a');
8  p1=(a+9)*(a+4)
9  p2=(x+2)*(x-7)
10 p3=(a-8)*(a-3)
11 p4=(x-8)*(x-2)
12 p5=(x-8)*(x+2)
13 p6=(x+8)*(x-2)
```

Scilab code Exa 13.2 Multiplication of algebraic expressions

```
1
2 clear;
3 clc;
4 close;
5 x=poly(0,'x');
6 p1=(2*x+5);
7 p2=(3*x+4);
8 ans=p1*p2
```

Scilab code Exa 13.3 Multiplication of algebraic expressions

```
1
2 clear;
3 clc;
4 close;
5 x=poly(0,'x');
6 p1=(3*x+7);
7 p2=(2*x+1);
8 p3=p1*p2;
9 disp(p3,"product=")
```

Scilab code Exa 13.4 Multiplication of algebraic expressions

```
1
2 clear;
3 clc;
4 close;
5 x=poly(0,'x');
6 p1=(7*x-5);
7 p2=(2*x+3);
8 p3=p1*p2;
9 disp(p3,"product=")
```

Scilab code Exa 13.5 Product of algebraic expressions

```
1
2 clear;
3 clc;
4 close;
5 x=poly(0,'x');
6 p1=(3*x-2);
7 p2=(4*x-7);
8 p3=p1*p2;
9 disp(p3,"product=")
```

Scilab code Exa 13.6 Multiplication of a trinomial

```
1
2 clear;
3 clc;
4 close;
5 x=poly(0,'x');
6 p1=(x+2);
7 p2=(x^2-x+1);
8 p3=p1*p2;//on collecting like terms
9 disp(p3,"product=")
```

Scilab code Exa 13.7 Product of a trinomial

```
1
2 //(a+b)*(a^2-ab+b^2)
3 clear;
```

```
clc;
close;
//on collecting like terms
val=string('a^3+b^3')
```

Scilab code Exa 13.8 Square of a binomial expression

```

clc;
close;
clear;
x=poly(0,'x');
p=(x+1)^2
p1=(x-1)^2
a=poly(0,'a');
p2=(a+9)^2
p3=string('(1-5xy)^2=1-10xy+25x^2y^2')
p4=string('(2x+7y)^2=4x^2 +28xy +49y^2')
p5=string('(3a-10b)^2=9a^2-60ab+100b^2')
```

Scilab code Exa 13.9 Square of a trinomial

```

clc;
close;
clear;
p1=string('(a+b+1)^2=a^2+b^2+1+2ab+2a+2b')
p2=string('(x-y+z)^2=x^2+y^2+z^2-2xy+2xz-2yz')
p3=string('(a-b-c)^2=a^2+b^2+c^2-2ab-2ac+2bc')
p4=string('(x+y-5)^2=x^2+y^2+25-10x-10y+2xy')
```

Scilab code Exa 13.10 Cube of a binomial

```
1
2 clc;
3 close;
4 clear;
5 x=poly(0,'x');
6 p=(x+1)^3
7 p1=(x-1)^3
8 a=poly(0,'a');
9 p2=(a+1)^3
10 p3=(1-a)^3
11 p4=string('(2x+3y)^3=8x^3+36x^2y+54xy^2+27y^3')
12 p5=string('(x-3y)^3=x^3-9x^2y+27xy^2-27y^3')
```

Scilab code Exa 13.11 Product of sum and difference

```
1
2 clc;
3 close;
4 clear;
5 x=poly(0,'x');
6 p=(x+9)*(x-9)
7 p1=string('(ab+10)(ab-10)=a^2*b^2-100')
8 p2=(4*x+5)*(4*x-5)
9 p3=(1+x)*(1-x)
10 a=poly(0,'a');
11 p4=(a-1/2)*(a+1/2)
12 p5=string('(a/3 + b/4)*(a/3 - b/4)=a^2/9 - b^2/16')
13 p6=string('{(a+b)+c}*{(a+b)-c}=(a+b)^2-c^2')
14 p7=string('{a+(b+c)}*{a-(b+c)}=a^2-(b+c)^2')
```

Chapter 14

Factors

Scilab code Exa 14.1 factors of given expression

```
1
2 //factors of 6a^2 + 3ac
3 clear;
4 clc;
5 close;
6 p=string('6*a^2+3*a*c ')
7 disp('=> 3a(2a+c)')
```

Scilab code Exa 14.2 Factorize given expression

```
1
2 //5*x^2*y^2-10*x^2*y+20*y^2
3 clear;
4 clc;
5 close;
6 mprintf("\n the highest common factor to each term
     is 5 and other factor is y \n")
7 disp('5y(x^2y-2x^2+4y)')
```

Scilab code Exa 14.3 Finding factors

```
1
2 //factors of a^2+cd+ad+ac
3 clear;
4 clc;
5 close;
6 mprintf(" \n (a^2+ac)+(ad+cd) => a(a+c)+d(a+d)  \n")
7 mprintf("the factors are:")
8 val=string('(a+c)(a+d)')
```

Scilab code Exa 14.4 Factorize if possible

```
1
2 //factorize , if possible ,ab+ac+bc+bd
3 clear;
4 clc;
5 close;
6 mprintf("\n there are no factors of this expression"
   )
```

Scilab code Exa 14.5 Factors of expression

```
1
2 //factors of ab-5a-3b+15
3 clear;
4 clc;
5 close;
6 //by arrangement into suitable pairs ,
```

```
7 mprintf("(ab-5a)-(3b-15) => a(b-5)-3(b-5)")
8 mprintf("\n the factors are: \n")
9 val=string('(b-5)(a-3)')
```

Scilab code Exa 14.6 Factorize the given expression

```
1
2 //x^2+13*x+36
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 p=x^2+13*x+36;
8 factors(p)
```

Scilab code Exa 14.7 Factorize the given expression in terms of x

```
1
2 //x^2-13*x+36
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 p=x^2-13*x+36;
8 factors(p)
```

Scilab code Exa 14.8 Factorize the given expression in terms of y

```
1
2 //y^2-13*y+30
```

```
clear;
clc;
close;
y=poly(0,'y');
p=y^2-13*y+30;
factors(p)
```

Scilab code Exa 14.9 Factorize the expression

```
//x^2-5*x-36
clear;
clc;
close;
x=poly(0,'x');
p=x^2-5*x-36;
factors(p)
```

Scilab code Exa 14.10 Factorize

```
//x^2+12*x-28
clear;
clc;
close;
x=poly(0,'x');
p=x^2+12*x-28;
factors(p)
```

Scilab code Exa 14.11 Factorize

```
1
2 //a^2-8*a*b-48*b^2
3 clear;
4 clc;
5 close;
6 a=poly(0,'a');
7 p=a^2-8*a-48;
8 factors(p)
9 mprintf( "the second letter b will appear in 1st
     term of each factor")
10 ans(1)="(4b+a)";
11 ans(2)="(-12b+a)"
```

Scilab code Exa 14.12 Factors of expression

```
1
2 //2*x^2+7*x+3
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 p=2*x^2+7*x+3;
8 factors(p);
9 ans(2)=ans(2)*2;
10 disp(ans(1),ans(2),"the factors of 2*x^2+7*x+3 are")
```

Scilab code Exa 14.13 Factorize of expression

```
1
2 //6*x^2+17*x-3
3 clear;
4 clc;
5 close;
```

```
6  x=poly(0,'x');
7  p=6*x^2+17*x-3;
8  factors(p);
9  ans(2)=ans(2)*6;//multiply by 6 the p1 factors to
       get the original factors of p
10 disp(ans(1),ans(2),"the factors of 6*x^2+17*x-3 are"
       )
```

Scilab code Exa 14.14 Factorize the given expression

```
1
2  //4*x^2-17*x-15
3  clear;
4  clc;
5  close;
6  x=poly(0,'x');
7  p=4*x^2-17*x-15;
8  factors(p);
9  ans(2)=ans(2)*4;
10 disp(ans(1),ans(2),"the factors of 4*x^2-17*x-15 are
       ")
```

Scilab code Exa 14.15 Representing square of binomial expression

```
1
2  //x^2+6*x+9
3  clear;
4  clc;
5  close;
6  x=poly(0,'x');
7  p=x^2+6*x+9;
8  factors(p);
```

```
9 disp(ans(1),"x^2+6*x+9 is square of binomial
    expression ")
```

Scilab code Exa 14.16 Checking complete square or not

```
1
2 //4*x^2+6*x+9
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 p=4*x^2+6*x+9
8 mprintf("is not a complete square")
9 //the 1st and 3rd terms are squares of 3and 2x
10 //for complete square the middle term must be +(2*
    sqrt(4x^2)*sqrt(9))=+12x
```

Scilab code Exa 14.17 Checking complete square or not

```
1
2 //4*x^2-20*x+25
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 p=4*x^2-20*x+25
8 factors(p);
9 disp(ans(1)*2,"is the complete square of binomial")
10 //disp("the 1st and 3rd terms are squares of 5 and 2
    x")
11 //disp("for complete square the middle term must be
    (2*sqrt(4*x^2)*sqrt(25)=20x")
```

Scilab code Exa 14.18 Factorize

```
1
2 //100*x^2-1
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 p=100*x^2-1;
8 factors(p);
9 ans(1)=10*ans(1);
10 ans(2)=10*ans(2);
11 disp(ans(1),ans(2),"the factors of 100*x^2-1  are")
```

Scilab code Exa 14.19 Factorize the expression

```
1
2 //36*a^2*b^2-25
3 clear;
4 clc;
5 close;
6 //the numbers squared are 6ab and 5")
7 disp("36*a^2*b^2-25=(6ab+5)(6ab-5)")
```

Scilab code Exa 14.20 Factorize the given expression

```
1
2 //factorize (a+b)^2 - c^2
3 clear;
```

```
clc;
close;
//using the formula, a^2-b^2=(a+b)(a-b)
val=string('(a+b+c)(a+b-c)')
```

Scilab code Exa 14.21 Factorize the expression

```

//factorize (a+b)^2 - (c-a)^2
clear;
clc;
close;
//using the formula, a^2-b^2=(a+b)(a-b)
val=string('(b+c)(2a+b-c)')
```

Scilab code Exa 14.22 Difference of two squares

```

clear;
clc;
close;
function[val]=formulae(a,b)
  val=(a+b)*(a-b)
endfunction

val=formulae(47.5,22.5)
```

Scilab code Exa 14.23 Area of ring between two concentric circles

```

```

```
2 //area of ring between 2 concentric circles.
3 //given ,r1=97mm, r2=83mm
4 clear;
5 clc;
6 close;
7 r1=97;r2=83;
8 //the area of ring is difference between the areas
     of 2 circles
9 diff_in_area=(r1^2-r2^2);
10 mprintf("difference in area=%ipi mm^2",diff_in_area)
```

Chapter 15

Fractions

Scilab code Exa 15.1 Algebraic fraction

```
1
2 //simplify (a+b)/(a^2-b^2)
3 clear;
4 clc;
5 close;
6 //as, by formula,(a^2-b^2)=(a+b)(a-b)
7 mprintf("\n (a+b)/((a+b)(a-b)) => 1/(a-b) \n")
```

Scilab code Exa 15.2 Simplifying the factors

```
1
2 clear;
3 clc;
4 close;
5 x=poly(0,'x');
6 p1=x^2+4*x-12;
7 p2=x^2+x-6;
8 p=p1/p2
```

Scilab code Exa 15.3 Reduction of fractions

```
1
2 //simplify 3a(a^2-4ab+4b^2)/6a(a^2+3ab-10b^2)
3 clear;
4 clc;
5 close;
6 //the factors 3a(a-2b) are common to numerator &
     denominator.
7 mprintf("\n the fraction is :\n")
8 string('(a-2b)/(2a(a+5b))')
```

Scilab code Exa 15.4 Division of fractions

```
1
2 clear;
3 clc;
4 close;
5 x=poly(0,'x');
6 p1=x;
7 p2=x+1;
8 p=p1/p2;
9 q1=x^2;
10 q2=x^2-1;
11 q=q1/q2;
12 p/q
```

Scilab code Exa 15.5 Multiplication of fractions

```
1
2 clear;
3 clc;
4 close;
5 x=poly(0,'x');
6 p1=x^4-27*x;
7 p2=x^2-9;
8 p=p1/p2;
9 q1=x^2+3*x+9;
10 q2=x+3;
11 q=q1/q2;
12 p/q
```

Scilab code Exa 15.6 Subtraction of fractions

```
1
2 //simplify a/(a-b) - a^2/(a^2-b^2)
3 clear;
4 clc;
5 close;
6 //as, (a^2-b^2)=(a+b)(a-b),substitute it.
7 mprintf("\n the fraction is :\n")
8 ans=string('ab/((a+b)(a-b))')
```

Scilab code Exa 15.7 Fraction Subtraction

```
1
2 //3/(a-b)-(2a+b)/(a^2-b^2)
3 clear;
4 clc;
5 close;
6 mprintf("\n on factorizing, the expression becomes \
   n");
```

```
7 //3/(a-b)-(2a+b)/(a+b)(a-b) => (3a+3b-2a-b)/(a+b)(a-
    b)
8 string('(a+2b)/((a+b)(a-b))')
```

Scilab code Exa 15.8 Subtraction of fractions

```
1
2
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 p1=x-1;
8 p2=x^2-x-2;
9 p=p1/p2;
10 q1=x+2;
11 q2=x^2+4*x+3;
12 q=q1/q2;
13 t=p-q;
14 y=numer(t) //numerator of t
15 z=factors(denom(t))//factors of denominator of t (
    more simplified form)
16 disp("val=(1+2x)/(1+x)(-2+x)(3+x)")
```

Scilab code Exa 15.9 Division of fractions

```
1
2 //x/(x-(1/x))
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 p1=x;
```

```
p2=1/x;
p3=p1-p2;
p=p1/p3
```

Scilab code Exa 15.10 Conversion of R in terms of R1 and R2

```

//1/R=1/R1-1/R2. get R
clear;
clc;
close;
disp("R=R1R2/(R2-R1)")
```

Scilab code Exa 15.11 solving simple equations involving algebraic fractions

```

clear;
clc;
close;
x=poly(0,'x');
p1=3/(x-2);
p2=5/(x-1);
// given, 3/(x-2)=5/(x-1)
for x=0.0:0.1:10.0
if(3*(x-1)==5*(x-2))
  format(7)
x
   break
end
end
```

Scilab code Exa 15.12 Solving algebraic fraction for n

```
1
2 clear;
3 clc;
4 close;
5 n=poly(0,'n');
6 p1=1/(n-2);
7 p2=1/(n-3);
8 p=p1+p2;
9 q=2/n;
10 //given p=q
11   z1=numer(p)*denom(q);
12   z2=numer(q)*denom(p);
13 //As,z1=z2. cancel the terms common on both sides
14   a=z1-z2;
15  n=roots(a)
```

Chapter 16

Graphs of Quadratic Functions

Scilab code Exa 16.1 Circumference of circle

```
1
2 //circumference of circle
3 clear;
4 clc;
5 close;
6 disp('C=2*pi*r')
7 //C-length of circumference.r-the length of radius
8 //2 (2,pi) of these 4 symbols represent constants .
9 disp("the variation of C depends on changes in r")
```

Scilab code Exa 16.2 Graph of given straight line

```
1
2 clear;
3 clc;
4 close;
5 //let a-the avg. amount paid. x-no. of customers. b
    -the expenses
```

```
6  //net profit is y=ax-b
7  x=320;y=4.50;
8  x=250;y=1.00;
9  //substitute in above equation
10 //4.5=320*a-b-equ.1;1=250*a-b-equ.2.subbstract equ.2
       from 1.
11 a=0.05;//we get
12 b=250*a-1;
13 x=poly(0,'x');
14 y=a*x-b;//equation to straight line
15 //if there is no profit i.e., y=0
16 for x=1:500
17 if(0.05*x-11.5==0)
18 mprintf("x=%i \n",x)
19 break
20 end
21 end
22 clf;
23 cust=[230 240 270 300 350 380];
24 profit=[0 0.5 2.0 3.5 6.0 7.5];
25 plot(cust,profit,6);
26 plot(230,0,'r->.diam');
27 //profit(y) depends on varying no. of customers(x).
      the no.'s 0.05 & 11.5 remained constant
28 xtitle("the straight line graph","no. of customers",
      "profit");
29 legend("y=0.05*x-11.5");
30 xgrid();
```

Scilab code Exa 16.3 Straight line equation

```
1
2  //y=mx+b
3  clear;
4  clc;
```

```
5  close;
6  clf;
7  x=linspace(0,3,4);
8  y=x;
9  plot2d(x,y,1);
10 y=x+2;
11 plot2d(x,y,4);
12 y=x-3;
13 plot2d(x,y,5);
14 xtitle("Equations of the form y=mx+b","x axis","y
       axis");
15 legend("y=x","y=x+2","y=x-3",2);
16 disp('y=mx+b');
17 //m is constant, b is fixed distance. (x,y) vary for
       different points on the line
18 xgrid()
```

Scilab code Exa 16.4 Graph of a function of second degree

```
1
2  clear;
3  clc;
4  close;
5  clf;
6  x=linspace(-3,3,11);
7  y=x^2;
8  plot2d(x,y,3);
9  xtitle("Parabola curve","x axis","y axis")
10 legend("y=x^2");
11 xgrid();
```

Scilab code Exa 16.5 Graph of parabola

```
1
2 clear;
3 clc;
4 close;
5 clf;
6 x=linspace(-3,3,11);
7 y=-x^2;
8 plot2d(x,y,3);
9 xtitle("curve of y=-x^2","x axis","y axis");
10 disp("this curve is parabola");
11 legend("y=-x^2");
12 xgrid();
```

Scilab code Exa 16.6 Curves of different parabolas

```
1
2 //y=ax^2
3 clear;
4 clc;
5 close;
6 clf;
7 x=linspace(-3,3,11);
8 y=2*x^2;
9 plot2d(x,y,3);
10 y=x^2;
11 plot2d(x,y,4);
12 y=x^2/2;
13 plot2d(x,y,5);
14 legend("y=2*x^2","y=x^2","y=x^2/2");
15 xtitle("The curves of y=ax^2","x axis","y axis");
16 //if a is negative, we get corresponding curves
     similar to y=-x^2
17 xgrid();
```

Scilab code Exa 16.7 Curves of given expression

```
1
2 //y=x^2+a or y=x^2-a
3 clear;
4 clc;
5 close;
6 clf;
7 x=linspace(-3,3,11);
8 y=x^2+2;
9 plot2d(x,y,3);
10 y=x^2;
11 plot2d(x,y,4);
12 y=x^2-3;
13 plot2d(x,y,5);
14 legend("y=x^2+2","y=x^2","y=x^2-3");
15 xtitle("Curves of y=x^2 +/- a","x axis","y axis");
16 xgrid();
```

Scilab code Exa 16.8 Change of axis

```
1
2 //y=x^2+a or y=x^2-a
3 clear;
4 clc;
5 close;
6 clf;
7 x=linspace(-3,3,11);
8 y=x^2;
9 plot2d(x,y,3);
10 plot(y=1)
11 legend("y=x^2");
```

```
12 xtitle("Change of axis","x axis","y axis");
13 xgrid();
14 mprintf("axis for y=x^2 becomes axis for y=x^2-3 by
      drawing new x axis 3 units above the original")
```

Scilab code Exa 16.9 Graph of curves

```
1
2 clear;
3 clc;
4 close;
5 clf;
6 x=linspace(-3,4,8);
7 y=(x-1)^2;
8 plot2d(x,y,3);
9 xtitle("Curve of y=(x-1)^2","x axis","y axis");
10 legend("y=(x-1)^2");
11 xgrid();
```

Scilab code Exa 16.10 graph of given expression

```
1
2 //129,130,131 examples
3 clear;
4 clc;
5 close;
6 clf;
7 x=linspace(-3,4,8);
8 y=(x-1)^2-4;
9 plot2d(x,y,5);
10 xtitle("Graph of y=(x-1)^2-4","x axis","y axis");
11 legend("y=(x-1)^2-4");
12 x=poly(0,'x');
```

```
13 y=(x-1)^2-4;
14 //131 concept
15 disp('At these points  curve cuts the axis of x')
16 x=roots(y)
17 xgrid();
```

Scilab code Exa 16.11 Graph of Y

```
1
2 clear;
3 clc;
4 close;
5 clf;
6 x=linspace(-3,5,9);
7 y=2*x^2-3*x-5;
8 plot2d(x,y,5);
9 xtitle("Graph of y=2*x^2-3*x-5","x axis","y axis");
10 x=poly(0,'x');
11 y=2*x^2-3*x-5;
12 //"at these points  curve cuts the axis of x"
13 x=roots(y)
14 x=3/4;
15 y=2*x^2-3*x-5;  //highest point
16 y=[0 -2 -4 y];
17 plot(x,y,'b--.+');
18 legend("y=2*x^2-3*x-5","axis of symmetry");
19 disp("NOTE: line from lowest point to the x axis is
     the axis of symmetry");
20 xgrid();
```

Scilab code Exa 16.12 Graph of parabola

```
1
```

```
clear;
clc;
close;
clf;
x=linspace(-5,4,10);
y=12-x-x^2;
plot2d(x,y,5);
xtitle("Graph of y=12-x-x^2 ","x axis","y axis");
x=poly(0,'x');
y=12-x-x^2;
//"at these points  curve cuts the axis of x"
x=roots(y)
x=-1/2;
y=12-x-x^2; //highest point
y=[0 2 4 6 8 10 y];
plot(x,y,'b--.pentagram');
legend("y=12-x-x^2","axis of symmetry");
//line from highest point to the x axis is the axis
   of symmetry
xgrid();
```

Scilab code Exa 16.13 Using graphs to solve quadratic inequalities

```

//y=x^2-4*x+3.values of x where y>0
clear;
clc;
close;
x=poly(0,'x');
y=x^2-4*x+3;
x=roots(y)
//for y>0, the values of x where y is above x axis
   are  x<1 or x>3
x=linspace(-2,6,9);
y=x^2-4*x+3;
```

```
12 plot2d(x,y,3);
13 xtitle("Using graphs to solve quadratic inequalities
     ","x axis","y axis");
14 legend("y=x^2-4*x+3");
15 xgrid();
```

Scilab code Exa 16.14 Using quadratic inequalities to describe regions

```
1
2 //y=x^2-5*x+5
3 clear;
4 clc;
5 clf;
6 close;
7 x=linspace(-2,7,10);
8 y=x^2-5*x+5;
9 plot2d(x,y,3);
10 plot2d3(x,y,7);
11 x=poly(0,'x');
12 y=x^2-5*x+5;
13 x=roots(y)
14 for x=0:5
15   for y=5:20
16     plot(x,y,'r.pentagram');     //y>0 region
17  end
18 end
19 xtitle("Using quadratic inequalities to describe
     regions","x axis","y axis");
20 xgrid();
21 legend("y=x^2-5*x+5","y<x^2-5*x+5 region","y>x^2-5*x
     +5 region",4);
```

Chapter 17

Quadratic Equations

Scilab code Exa 17.1 Solving quadratic equation

```
1
2 //x^2-x-1=0
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 y=x^2-x-1;// y=0
8 mprintf("the solution is \n")
9 format(7)
10 x=roots(y)
```

Scilab code Exa 17.2 Solving quadratic equation

```
1
2 //3*x^2-5*x+1=0
3 clear;
4 clc;
5 close;
```

```
x=poly(0,'x');
y=3*x^2-5*x+1;// y=0
mprintf("the solution is \n")
format(6)
x=roots(y)
```

Scilab code Exa 17.3 Solving equation

```

clear;
clc;
close;
x=poly(0,'x');
p1=1/(x-1);
p2=1/(x+2);
y=p1-p2;
y1=1/16;
a=numer(y)*denom(y1);
b=numer(y1)*denom(y);
r=a-b;
mprintf("the solution is \n");
format(6)
x=roots(r)
```

Scilab code Exa 17.4 Solution of quadratic equation

```

//x^2-2*x-15=0
clear;
clc;
close;
x=poly(0,'x');
y=x^2-2*x-15;// y=0
```

```
8 mprintf("the solution is \n")
9   mprintf("x=%i, \t",roots(y))
```

Scilab code Exa 17.5 quadratic equation Solution

```
1
2 //9*x*(x+1)=4
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 y=9*x*(x+1)-4; //y=0
8   mprintf("the solution is \n")
9   mprintf("x=%f, \n",roots(y))
```

Scilab code Exa 17.6 quadratic equation Solution

```
1
2 //5*x^2+9*x-2=0
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 y=5*x^2+9*x-2;
8 a=5;b=9;c=-2;//from equation we get these values
9 //using the formula - solution of quadratic equation
    ax^2+bx+c=0
10 x=(-b+sqrt(b^2-4*a*c))/(2*a);
11 mprintf("\t x=%f \n \n or \n ",x)
12 x=(-b-sqrt(b^2-4*a*c))/(2*a);
13 mprintf(" x=%f",x)
```

Scilab code Exa 17.7 Solving the equation

```
1
2 clear;
3 clc;
4 close;
5 x=poly(0,'x');
6 p1=1/(x-1);
7 p2=2/3;
8 p3=2/(x-3);
9 p=(p1+p2-p3);
10 p=3*numer(p);//As p=0 and to remove fractions,
     multiply by 3
11 a=2;b=-11;c=3;//from equation we get these values
12 //using the formula - solution of quadratic equation
     ax^2+bx+c=0
13 mprintf("the solution is")
14 format(6)
15 x=(-b+sqrt(b^2-4*a*c))/(2*a)
16 mprintf("or \n")
17 x=(-b-sqrt(b^2-4*a*c))/(2*a)
```

Scilab code Exa 17.8 Time taken when body is projected vertically upwards

```
1
2
3 //given u=160,g=10,h=240
4 clear
5 clc
6 close
7 //using the formulae "h=u*t-(g*t^2)/2"
```

```
u=160;
g=10;
h=240;
t=poly(0,'t');
r=(240-u*t+(g*t^2)/2)//u*t-(g*t^2)/2-h=0
a=5;b=-160;c=240;//from equation we get these values
//using the formulae - solution of quadratic
   equation ax^2+bx+c=0
t=(-b+sqrt(b^2-4*a*c))/(2*a);
t1=(-b-sqrt(b^2-4*a*c))/(2*a);
mprintf("\n the solution  is  t=%f or t=%f\n",t,t1)
   //the answer given in textbook is wrong
```

Scilab code Exa 17.9 Speed and time for journey

```

clear;
clc;
close;
//let x km/hr is avg. speed for 1st journey
//as velocity=distance/time, time for 1st journey is
    84/x hrs
//speed for return journey is 84/(x+4).from given
   data, this is <1/2 hr than the 1st time
x=poly(0,'x');
//In algebraic form,(84/x)-(84/(x+4))=1/2
y=(84/x)-(84/(x+4))-1/2; //y=0. so, numerator=0
x=roots(numer(y));
//velocity can't be in negatives.take +ve root
disp("avg. speed for 1st journey is x=24km/h")
distance=84;//given
velocity=24;//found
time=distance/velocity;//time for 1st journey
time1=distance/(velocity+4);//time for 2nd journey
mprintf("total_time=%fhours",time+time1)
```

Scilab code Exa 17.10 Solving first degree equations

```
1 //x+y=1, 38x^2-x*y+y^2=37
2
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 y=1-x;
8 //substitute y=1-x in equ. 38x^2-x*y+y^2=37
9 Y=3*x^2-x*(1-x)+(1-x)^2-37;
10 x=roots(Y);
11 y=1-x;
12 mprintf('the solutions are: \n')
13 mprintf(" (%f,%f) \n",x,y)
```

Scilab code Exa 17.11 Solving symmetric equations

```
1
2
3 //x+y=19, xy=84
4 clear;
5 clc;
6 close;
7 x=poly(0,'x');
8 //substitute y=19-x in xy=84
9 Y=x*(19-x)-84;
10 x=roots(Y);
11 y=19-x;
12 mprintf('the solutions are: \n')
13 mprintf("(x,y)=(%i,%i) \n",x,y)
```

Scilab code Exa 17.12 Solving the equations

```
1
2 //x^2+y^2=89, xy=40
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 //substitute y=40/x in x^2+y^2=89
8 Y=x^2+(40/x)^2-89;
9 x=roots(numer(Y));//Y=0, numerator=0
10 y=sqrt(89-x^2);
11 mprintf('the solutions of (x,y) are: \n')
12 xy=[x,y]
```

Scilab code Exa 17.13 Solving quadratic inequlaities

```
1
2 //x^2-6*x+8<0
3 clear;
4 clc;
5 close;
6 x=poly(0,'x');
7 y=x^2-6*x+8;
8 //the product is negative only if either one of the
     factors is negative
9 f=factors(y);//these factors are <0
10 //f(1)>0 and f(2)<0 \n \t or \t \n f(1)<0 and f(2)>0
11   x=string(-2:7);//by number line method,
12 n=string('<'+strcat(x,'~~~')+'>') //-2 to 7 no. line
13 n1='<';n2='';
14     for x=-2:2
```

```
15        n1=n1+'----';
16      end
17         for x=2:8
18        n2=n2+'+++';
19      end
20      mprintf(n1+n2+'>'+'       '+'(x-2)'+'\n')
21  n1='<';n2='';
22        for y=-2:4
23       n1=n1+'----';
24      end
25         for y=4:8
26        n2=n2+'+++';
27      end
28      mprintf(n1+n2+'>'+'       '+'(x-4)'+'\n')
29
30  // from diagram, (x-2) is +ve when x>2 & -ve when x
       <2 by using + ans - signs. same in the case of (x
       -4)
31      mprintf("\n solution of x^2-6*x+8<0 is \n 2<x<4"
          )
```

Scilab code Exa 17.14 Solving the inequality

```
1
2  //(2*x-1)(x+2)(3-x)>0
3  clear;
4  clc;
5  close;
6  x=string(-4:5);//by number line method
7  n=string('<'+strcat(x,'~~~')+'>')  //-2 to 7 no.
       line
8  n1='<';n2='';
9       for x=-4:1
10        n1=n1+'----';
11      end
```

```
12          for x=0.5:5
13         n2=n2+'++++';
14       end
15       mprintf(n1+n2+'>'+'      '+'(2x-1)')
16  n1='<';n2='';
17         for y=-4:-2
18        n1=n1+'----';
19       end
20          for y=-2:5
21         n2=n2+'++++';
22       end
23       mprintf(n1+n2+'>'+'      '+'(x+2)')
24  n1='<';n2='';
25         for y=-4:3
26        n1=n1+'++++';
27       end
28          for y=3:5
29         n2=n2+'----';
30       end
31       mprintf(n1+n2+'>'+'      '+'(3-x)'+'\n')
32       mprintf("the solution  is  0.5<x<3 \n or  \n x
           <-2")
```

Chapter 18

Indices

Scilab code Exa 18.1 Graph of exponential function

```
1
2 clear;
3 clc;
4 close;
5 clf;
6 x=[0 1 2 3 4];
7 y=2^x;
8 xtitle("Graph of 2^x","x-axis","y-axis");
9 plot(x,y,"o-");
10 legend("y=2^x");
11 xgrid();
```

Scilab code Exa 18.2 Operations with standard forms

```
1
2 clear;
3 clc;
4 close;
```

```
5  //EX(1):
6  function [val]=answer(u,v,x,y)
7    val=u*v*10^(x+y)
8  endfunction
9  val=answer(1.2,2.3,4,3)
10
11 //EX(2):
12 function[val1]=answer1(u,v,x,y)
13   val1=(u/v)*10^(x-y)
14 endfunction
15 val1=answer1(4.8,1.6,8,3)
```

Chapter 19

Logarithms

Scilab code Exa 19.1 Finding values from the graph

```
1
2 clear ;
3 clc;
4 close;
5 clf;
6 x=linspace(0,1,7);
7 y=10^x;
8 plot2d(x,y,2);
9 xtitle(" graph of y=10^x","x axis","y axis");
10 legend("y=10^x");
11 xgrid()
12
13 //ex1:1.8*2.6=? ,from graph
14 //1.8=10^0.26 \n 2.6=10^0.42
15 x=10^0.26;y=10^0.42;
16 format(4)
17 ex1_ans=x*y//from the graph
18
19 //ex2:9^(1/3)
20 //9=10^0.96
21 x=10^0.96;
```

```
22 format(4)
23 ex2_ans=x^(1/3)//third law of indices
```

Scilab code Exa 19.2 Notation for logarithms

```
1
2 clear;
3 clc;
4 close;
5 ans1=log10(56.2)
6 ans2=log2(1024)
7 ans3=log10(1000)
8 ans4=log10(81)/log10(3)
```

Scilab code Exa 19.3 Antilogarithm

```
1
2 //no. whose logarithm is 2.3714
3 clear;
4 clc;
5 close;
6 mantissa=0.3714;
7 disp("from anti-logarithm table,corresponding no. is
    2352")
8 // As,characteristic is 2,no. must lie between 100 &
    1000.\n \n hence 3 significant figures in the
   intergral part
9 235.2
```

Scilab code Exa 19.4 Logarithm of x

```
1
2 //value of (57.86*4.385)
3 clear;
4 clc;
5 close;
6 //log(p*q)=log(p)+log(q)
7 p=57.86;q=4.385;
8 logx=log10(p)+log10(q);
9 format(6)
10 x=10^logx
```

Scilab code Exa 19.5 Finding the logarithm

```
1
2 //value of (5.672*18.94)/1.758
3 clear;
4 clc;
5 close;
6 //log(p*q)=log(p)+log(q) , log(p/q)=log(p)-log(q)
7 p=5.672;q=18.94;r=1.758;
8 logx=log10(p)+log10(q)-log10(r);
9 format(6)
10 x=10^logx
```

Scilab code Exa 19.6 Finding the Nth root

```
1
2 //5th root of 721.8
3 clear;
4 clc;
5 close;
6 //log(a)^n=n*log(a)
7 p=721.8;n=1/5;
```

```
8 logx=n*log10(p);
9 format(6)
10 x=10^logx
```

Scilab code Exa 19.7 Finding the logarithms of given numbers

```
1
2 //logs of 0.3185,0.03185,0.003185
3 clear;
4 clc;
5 close;
6 x=0.3185;y=0.03185;z=0.003185;
7 logx=log10(0.3185)
8 logy=log10(0.03185)
9 logz=log10(0.003185)
```

Scilab code Exa 19.8 Finding the number whose log value is given

```
1
2 //no. with logarithm -3.5416
3 clear;
4 clc;
5 close;
6 mantissa=0.5416;
7 disp("from anti-logarithm table, corresponding no.is
    3840 ")
8 //characteristic is -3.\n \n hence there will be 2
   zeros after the decimal point
9 val=0.003480
```

Scilab code Exa 19.9 Sum of logarithms

```
1
2 //sum of logarithms -1.6173,-2.3415,-1.6493,-0.7374
3 clear;
4 clc;
5 close;
6 x=.6173;y=.3415;z=.6493;a=0.7374;//mantissa's of all
    4 logarithms
7 mantissa=x+y+z+a;
8 //2 which is carried forward from the addition of
   mantissa is +ve.
9 characteristic=-1-2-1-0+2;//characteristic part of
   all 4 logarithms
10 mprintf("sum=-%f",mantissa)
```

Scilab code Exa 19.10 Difference of logarithms

```
1
2 //logarithm :  -1.6175-(-3.8463)
3 clear;
4 clc;
5 close;
6 mantissa=1.6175-0.8463;
7 //in borrowing to subtract 8 from 6, -1(
   characteristic) becomes -2
8 characteristic=-2-(-3);
9 mantissa+characteristic
```

Scilab code Exa 19.11 Multiplication of logarithm

```
1
2 //logarithm : multiply -2.8763 by 3
```

```
3 clear;
4 clc;
5 close;
6 num=2.8763;//given
7 mantissa=0.8763;
8 mul=mantissa*3;
9 //when mantissa is multiplied, 2 is carried forward.
    (-2)*3=-6. the characteristic becomes -6+2=-4
10 val=-4.6289
```

Scilab code Exa 19.12 Multiplication of logarithm

```
1
2 //logarithm: -1.8738*1.3
3 clear;
4 clc;
5 close;
6 //multiply mantissa & characteristic seperately and
    add results
7 x=0.8738*1.3;
8 y=-1*1.3;
9 //as y=-1.3 is -ve, change it to -2.7 to make
    mantissa +ve
10 y=-2.7;
11 mantissa_sum=0.13594+0.7; //of x & y
12 characteristic_sum=1-2;
13 characteristic_sum-mantissa_sum
```

Scilab code Exa 19.13 Division of logarithm

```
1
2 //divide -5.3716 by 3
3 clear;
```

```
clc;
close;
//characteristic=-5=-6+1 or the log as -6+1.3716
characteristic=-6/3;
mantissa=1.3716/3;
characteristic-mantissa
```

Scilab code Exa 19.14 Finding the logarithm

```

//log50 to the base e
clear;
clc;
close;
log(50)//natural logarithm
// or, log50_base_e=log10(50)*2.3026
```

Chapter 21

Variation

Scilab code Exa 21.1 Graph of spring extension for different weights

```
1
2 //spiral spring example
3 clc;
4 clear;
5 close;
6 clf();
7 weight=linspace(0,0.5,6);
8 extension=[0 0.15 0.3 0.44 0.6 0.75];
9 plot2d(weight,extension,13);
10 xtitle("spiral spring example","vaues of L","values
     of E");
11 xgrid();
12 //Extension varies directly as the attached load
13 //let E=Extension,L=Load
14 //to find 'k',a pair of values is taken at point p
15 L=0.5;E=0.75;
16 plot(L,E,'r..');
17 legend("E=KL",'POINT P',2);
18 //substitute 'p' in E=K*L
19 K=E/L;
20 mprintf("the law is : \n E= %fL \n",K)
```

Scilab code Exa 21.2 Comparison of voltmeters

```
1
2 //voltmeters example
3 clc;
4 clear;
5 close;
6 clf();
7 C=[1.9 2.75 3.8 4.8 5.8];
8 K=[5.75 8.3 11.2 14 16.8];
9 //C and K are connected by the law of the form K=mC+
    b
10 plot2d4(C,K,3);
11 plot(3.4,10,'r.pentagram');
12 plot(5.3,15.5,'r.pentagram');
13 xtitle("voltmeters graph","C","K");
14 xgrid();
15 legend("K=mC+b","POINTS A,B",2);
16 //substituting A,B points in K=mC+b,we get
17 //10=3.4m+b ------->equ(1) ; 15.5=5.3m+b ------->equ
    (2)
18 //substracting
19 m=(10-15.5)/(3.4-5.3);
20 b=10-(3.4*m);
21 mprintf("the law is: \n K=%fC+%f",m,b)
```

Scilab code Exa 21.3 Inverse variation

```
1
2  //y varies as cube root of x
3 clear;
```

```
clc;
close;
//y=k*x^(1/3)
y=3;x=64;//given
k=y/(x^(1/3));
mprintf("(1) y=0.75*x^(1/3)");
//when y=15/4,x=?
x=(15/4)^3/(0.75)^3;
mprintf("(2) x=%i",x)
```

Scilab code Exa 21.4 Time of vibration of simple pendulum

```

//time of vibration of pendulum varies as sqrt(
    length)
clear;
clc;
close;
//let l=length of pendulum in meters, t=the time of
    variation
//t=k*sqrt(l) => vibration of pendulum varies as
    sqrt(length)
l=1;t=1;//given
k=t/(sqrt(l));
l=1.06;//given
format(5);
time_in_sec=k*sqrt(l)
```

Scilab code Exa 21.5 Triangle area

```

//A=b*h/2
clear;
```

```
4 clc;
5 close;
6 //A= the area of triangle.b=the length of base.h=the
      corresponding altitude
7 // A depends on both b &h
8 mprintf("\n A=k*b*h \n ")
9 k=1/2
```

Scilab code Exa 21.6 Volume varies inversely with peressure

```
1
2 //volume of mass os gas at const. temp. varies
     inversly as pressure on it
3 clear
4 clc
5 close
6 //v=volume
7 //T=absolute temperature
8 //P=pressure
9 mprintf("\n v=k*T/P \n")
```

Scilab code Exa 21.7 Relation between R and l

```
1
2 //resistance of a current wire varies as length
     varies also, varies inversly as the cross section
      of wire
3 clear
4 clc
5 close
6 //R=the resistance
7 //l=the length
8 //the cross section
```

```
9 mprintf("\n R=k*l/A \n ")
```

Scilab code Exa 21.8 Joint variation

```
1
2 clear;
3 clc;
4 close;
5 // y varies directly as x and inversly as z^3
6 mprintf("\n y=k*x/z^3 \n")
7 x=15;z=12;y=1/36;//given
8 //substituting given values
9 format(5)
10 k=y*z^3/x
```

Scilab code Exa 21.9 F varies directly with strength and inversely with distance

```
1
2 clear;
3 clc;
4 close;
5 // force of 2 magnetic poles varies as product of
    their strength & inversly as square of distance
    between them
6 //F=the force. m1,m2=the pole strengths. d=the
    distance apart
7 mprintf("\n F=k*m1*m2/d^2 \n")
8 F=3;m1=8;m2=6;d=4;//given
9 k=F*d^2/(m1*m2);
10 m1=5;m2=9;d=2;
11 Force_in_newtons=k*m1*m2/d^2
```

Chapter 22

The determination of Laws

Scilab code Exa 22.1 Plotting against power of a number

```
1
2 //y=a*x^2+b
3 clear;
4 clc;
5 close;
6 clf;
7 x=[0 0.5 1 1.5 2 2.5];
8 y=[-10 -9.25 -7 -3.25 2 8.75];
9 plot2d(x^2,y,3);
10 xtitle("Graph of y=ax^2+b","x axis","y axis");
11 xgrid;
12 //the values of a & b can be found by substituting
     two suitable points(x,y)in a*x^2+b-y=0
13 x=1;y=-7;//p1=-a+b+7
14 x=4;y=2;//p2=4*a+b-2
15 a=poly(0,'a');
16 p=-a+7-(4*a-2);
17 a=roots(p);
18 x=1;y=-7;
19 b=y-a*x^2;
20 x=poly(0,'x');
```

```
21 //(or) by inspection of graph, intercept on y-axis
     is (i.e., b) is -10 and a,the gradient of the
     line,is 3
22 mprintf("\n Hence, the law is\n")
23 x=poly(0,'x');
24 y=3*x^2-10
25 mprintf("or by solving by the method of Section 185"
     )
26 y=a*x^2+b
```

Scilab code Exa 22.2 Law connecting the logarithms

```
1
2 //y=a*x^n
3 clear;
4 clc;
5 close;
6 clf;
7 x=[18 20 22 24 25];
8 y=[623 863 1160 1519 1724];
9 //taking log on both sides for y=a*x^n =>log(y)=n*
     log(x)+log(a)  ....equ(1)
10 logx=log10(x);
11 logy=log10(y);
12 plot2d(logx,logy,13);
13 //select points A & B on straight line.
14 plot(1.398,3.236,'r.diam');
15 plot(1.255,2.795,'r.diam');
16 n=poly(0,'n');
17 //3.236=1.398*n+log(a).substitute point A in equ
     ...(1),GIVES equ(3)
18 //2.795=1.255*n+log(a).substitute point B in equ
     ...(1),GIVES equ(4)
19 //equ(3)-equ(4)
20 p=(3.236-1.398*n)-(2.795-1.255*n);
```

```
21 n=roots(p);
22 mprintf("y=a*x^n")
23 format(5)
24 a=10^(2.795-1.255*n)
25 xtitle("graph of y=a*x^n ","log x ","log y ");
26 legend("y=a*x^n","points A,B",2);
27 xgrid;
28 mprintf("\n y=0.08*x^3.08\n ");//substituting a,n
     values in y=a*x^n
```

Chapter 23

Rational and Irrational Numbers

Scilab code Exa 23.1 Operation with surds

```
1
2 //ex(1) (sqrt(5)+sqrt(20))
3 clear;
4 clc;
5 close;
6 val=string('(sqrt(5)+sqrt(20))');
7 if((sqrt(5)+sqrt(20))==3*sqrt(5))
8     val_1=evstr(val)
9 end
10 //ex(2) sqrt(27)-sqrt(75)+sqrt(48)
11 val=string('sqrt(27)-sqrt(75)+sqrt(48)');
12     val_2=evstr(val)
```

Scilab code Exa 23.2 Rationalise

```
1
```

```
2  //1/(sqrt(5)-sqrt(2))
3  clear;
4  clc;
5  close;
6  //rationalising the denominator
7  function[denom1]=inputs(a,b)
8       denom1=(sqrt(a)+sqrt(b))*(sqrt(a)-sqrt(b))
9  endfunction
10 [denom1]=inputs(5,2);
11 denom1=string(denom1);
12 numer1=string('(sqrt(5)+sqrt(2))');
13 val=string(numer1+'/'+denom1)
14 mprintf("i.e.,")
15 val=evstr(val)
```

Scilab code Exa 23.3 Simplify surds

```
1
2  //(sqrt(5)-1)/(sqrt(5)+1)
3  clear;
4  close;
5  clc;
6  //rationalising the denominator
7  function[denom1]=inputs(a,b)
8       denom1=(sqrt(a)+sqrt(b))*(sqrt(a)-sqrt(b));
9  endfunction
10 [denom1]=inputs(5,1);
11 denom1=string(denom1);
12 numer1=string('(6-2*sqrt(5))');
13 val=string(numer1+'/'+denom1)
14 mprintf("i.e.,")
15 val=evstr(val)
```

Chapter 24

Arithmetical and Geometrical Series

Scilab code Exa 24.1 Arithmetic series

```
1
2 clc;
3 clear;
4 close;
5 //ex(1) 7,13,19,25....
6 common_diff=19-13
7 //ex(2) 6,4,2,0,-2
8 common_diff=2-4
```

Scilab code Exa 24.2 Nth term in arithmetic series

```
1
2 clc;
3 clear;
4 close;
5 //ex(1) in the series 7,10,13,.... the common
    difference is 3. 10th trerm is ?
```

```
nth_term=string('7+(n-1)*3')
term10=7+(10-1)*3
//ex(2) i the series 6,2,-2,-6,....and d=-4
nth_term=string('6-(n-1)*4')
term8=6+(8-1)*-4
```

Scilab code Exa 24.3 Arithmetic mean

```

//insert 3 A.M's between 4 and 20
clc;
clear;
close;
//let 4,a,b,c,20 are in A.P. using, l=a+(n-1)*d
d=(20-4)/(5-1);
a=4+d;
b=a+d;
c=b+d;
mprintf("the five terms are 4,%i,%i,%i,20",a,b,c)
```

Scilab code Exa 24.4 Finding common difference in AP

```

//sum of A.P of 8 terms is 90.1st term is 6.
clear;
clc;
close;
// using s=n*{2*a+(n-1)*d}/2
//substituting given values
for d=0:0.001:100
  if(90==8/2*{2*6 + (8-1)*d})
format(5)
d
```

```
12      break
13    end
14  end
```

Scilab code Exa 24.5 Finding n value in arithmetic sum

```
1
2  clear;
3  clc;
4  close;
5  // using s=n*{2*a+(n-1)*d}/2
6  a=3;d=3;s=135;
7  //substituting given values
8  n=poly(0,'n');
9  p=n/2*{6 + (n-1)*3}-135;
10 n=roots(p)
11 mprintf("\n As root -10 is inadmissible, the
       solution is n=9")
```

Scilab code Exa 24.6 Geometric series

```
1
2  clc;
3  clear;
4  close;
5  //ex(1).1,2,4,8,...
6  commom_ratio=4/2
7  //ex(2). 1,1/2,1/4,1/8,....
8  common_ratio=(1/4)/(1/2)
9  //ex(3). 2,-6,18,-54
10 common_ratio=-6/2
11 //ex(4). R,R^2,R^3,R^4....
12 R=poly(0,'R');
```

```
13 common_ratio=R^2/R
```

Scilab code Exa 24.7 Seventh term of given series

```
1
2 //7th term of the series 3,6,12,....
3 clear;
4 clc;
5 close;
6 //in the series r=2, so using the formula
7 // nth term=a*r^(n-1)
8 a=3;n=7;//given data
9 term7=3*(2)^(7-1);
10 mprintf("\n the seventh term of the series is %i",
   term7)
```

Scilab code Exa 24.8 Eighth term of given series

```
1
2 //8th term of the series 2,-6,18,-54,.....
3 clear;
4 clc;
5 close;
6 //in the series r=-3, so using the formula
7 // nth term=a*r^(n-1)
8 a=2;n=8;//given data
9 term8=2*(-3)^(8-1);
10 mprintf("\n the eighth term of the series is %i",
   term8)
```

Scilab code Exa 24.9 Finding the 5th term

```
1
2 //5th term of the series.1st term is 100 and common
     ratio(r) is 0.63
3 clear;
4 clc;
5 close;
6 // using the formula
7 //nth term=a*r^(n-1)
8 a=100;n=0.63;//given data
9 mprintf("\n the fifth term of the series is \n")
10 format(6)
11 term5=100*0.63^(5-1)
```

Scilab code Exa 24.10 Finding the common ratio

```
1
2 //3rd term of G.P is 4.5 and 9th is 16.2
3 clear;
4 clc;
5 close;
6 // nth term=a*r^(n-1)
7 term3=4.5;//given data
8 //'a*r^(3-1)=4.5 ---equ(1)'
9 term9=16.2;//given
10 //'a*r^(9-1)=16.2 ---equ(2)'
11 mprintf("\n the common ratio is :\n");
12 format(7)
13 r=(16.2/4.5)^(1/6)//equ(2)/equ(1)
```

Scilab code Exa 24.11 Sum of seven terms of the series

```
1
2 //sum of 7 terms of the series 2,3,4,5,....
3 clear;
4 clc;
5 close;
6 r=3/2;a=2;n=7;//given
7 //using the formula
8 S=string('a*(r^(n)-1)/(r-1)')
9 disp("substituting the given values ")
10 format(6)
11 Sum=evstr(S)
```

Scilab code Exa 24.12 Sum of 7 terms

```
1
2 //sum of 7 terms of the series 4,-8,16,....
3 clear;
4 clc;
5 close;
6 r=-8/4;a=4;n=7;//given
7 //using the formula
8 S=string('a*(r^(n)-1)/(r-1)');
9 //substituting the values
10 Sum=evstr(S)
```

Scilab code Exa 24.13 Sum of infinite terms

```
1
2 //sum to infinity series 2 + 1/2 + 1/8 + .....
3 clear;
4 clc;
5 close;
6 a=2;r=1/4;//given
```

```
7 //using the formula
8 S_infinity=string('a/(1-r)');
9 Sum=evstr(S_infinity)
```

Scilab code Exa 24.14 Sum to infinity of the series

```
1
2 //sum to infinity series 5 - 1 + 1/5 - .....
3 clear;
4 clc;
5 close;
6 a=5;r=-1/5;//given
7 //using the formula
8 S_infinity=string('a/(1-r)');
9 Sum=evstr(S_infinity)
```