**Program 2:**

/\*Name- CHINMAY RAJ SHAH

Section- H

Roll number- 50

University Roll number- 2016711\*/

#include <stdio.h>

double function(double x)

{

return x\*x-2\*x;

}

int main()

{

printf(“Name: CHINMAY RAJ SHAH\n Section: H\n Class roll number: 50\n University roll number: 2016711\n ”);

double a, b, c, fc;

printf("Enter Range : ");

scanf("%lf%lf", &a, &b);

if(function(a) \* function(b) < 0)

{

c = (a + b) / 2;

fc = function(c);

while(fc < -0.001 || fc > 0.001)

{

printf("a = %lf, b = %lf, c = %lf, function(c) = %lf\n", a, b, c, fc);

if(function(a) \* fc < 0)

b = c;

else

a = c;

c = (a + b) / 2;

fc = function(c);

}

printf("final value of x = %lf, function(x) = %lf", c, fc);

}

else

printf("Given Range is invalid.\n");

return 0;

}

**OUTPUT:**

(i) Name- CHINMAY RAJ SHAH

Section- H

Roll number- 50

University Roll number- 2016711

Enter Range : 1 4

a = 1.000000, b = 4.000000, c = 2.500000, function(c) = 1.250000

a = 1.000000, b = 2.500000, c = 1.750000, function(c) = -0.437500

a = 1.750000, b = 2.500000, c = 2.125000, function(c) = 0.265625

a = 1.750000, b = 2.125000, c = 1.937500, function(c) = -0.121094

a = 1.937500, b = 2.125000, c = 2.031250, function(c) = 0.063477

a = 1.937500, b = 2.031250, c = 1.984375, function(c) = -0.031006

a = 1.984375, b = 2.031250, c = 2.007812, function(c) = 0.015686

a = 1.984375, b = 2.007812, c = 1.996094, function(c) = -0.007797

a = 1.996094, b = 2.007812, c = 2.001953, function(c) = 0.003910

a = 1.996094, b = 2.001953, c = 1.999023, function(c) = -0.001952

final value of x = 2.000488, function(x) = 0.000977

(ii) Name- CHINMAY RAJ SHAH

Section- H

Roll number- 50

University Roll number- 2016711

Enter Range : 2 3

Given Range is invalid.

**PROGRAM1:**

/\* Name- CHINMAY RAJ SHAH

Section- H

Roll number- 50

University Roll number- 2016711

\*/

#include <stdio.h>

#include <math.h>

int main()

{

printf(“Name: CHINMAY RAJ SHAH\n Section: H\n Class roll number: 50\n University roll number: 2016711\n ”);

double a, b, c, d, r1, r2;

printf("Enter va1ue of a : ");

scanf("%lf", &a);

printf("Enter va1ue of b : ");

scanf("%lf", &b);

printf("Enter va1ue of c : ");

scanf("%lf", &c);

d = b \* b - 4 \* a \* c;

if(d < 0)

printf("Roots are imaginary.\n");

else

{

r1 = (-b + sqrt(d)) / (2 \* a);

r2 = (-b - sqrt(d)) / (2 \* a);

printf("Roots are : %lf and %lf\n", r1, r2);

}

return 0;}

**OUTPUT:**

(i) Name- CHINMAY RAJ SHAH

Section- H

Roll number- 50

University Roll number- 2016711

Enter va1ue of a : 1

Enter va1ue of b : 3

Enter va1ue of c : 2

Roots are : -1.000000 and -2.000000

(ii) Name- CHINMAY RAJ SHAH

Section- H

Roll number- 50

University Roll number- 2016711

Enter va1ue of a : 1

Enter va1ue of b : 2

Enter va1ue of c : 3

Roots are imaginary.

**PROGRAM 3:**

/ \*Name- CHINMAY RAJ SHAH

Section- H

Roll number- 50

University Roll number- 2016711\*/

#include <stdio.h>

double function(double x)

{

return x \* x - 2 \* x;

}

int main()

{

printf(“Name: CHINMAY RAJ SHAH\n Section: H\n Class roll number: 50\n University roll number: 2016711\n ”);

double a, b, c, fc, fa, fb;

printf("Enter Range : ");

scanf("%lf%lf", &a, &b);

fa = function(a);

fb = function(b);

if(function(a) \* function(b) < 0)

{

c = (a \* fb - b \* fa) / (fb - fa);

fc = function(c);

while(fc < -0.001 || fc > 0.001)

{

printf("a = %lf, b = %lf, c = %lf, function(c) = %lf\n", a, b, c, fc);

if(fa \* fc < 0)

{

b = c;

fb = fc;

}

else

{

a = c;

fa = fc;

}

c = (a \* fb - b \* fa) / (fb - fa);

fc = function(c);

}

printf("Final value of x = %lf, function(x) = %lf", c, fc);

}

else

printf("Invalid Range.\n");

return 0;

}

**OUTPUT:**

(i) Name- CHINMAY RAJ SHAH

Section- H

Roll number- 50

University Roll number- 2016711

Enter Range : 1 4

a = 1.000000, b = 4.000000, c = 1.333333, function(c) = -0.888889

a = 1.333333, b = 4.000000, c = 1.600000, function(c) = -0.640000

a = 1.600000, b = 4.000000, c = 1.777778, function(c) = -0.395062

a = 1.777778, b = 4.000000, c = 1.882353, function(c) = -0.221453

a = 1.882353, b = 4.000000, c = 1.939394, function(c) = -0.117539

a = 1.939394, b = 4.000000, c = 1.969231, function(c) = -0.060592

a = 1.969231, b = 4.000000, c = 1.984496, function(c) = -0.030767

a = 1.984496, b = 4.000000, c = 1.992218, function(c) = -0.015504

a = 1.992218, b = 4.000000, c = 1.996101, function(c) = -0.007782

a = 1.996101, b = 4.000000, c = 1.998049, function(c) = -0.003899

a = 1.998049, b = 4.000000, c = 1.999024, function(c) = -0.001951

Final value of x = 1.999512, function(x) = -0.000976

(ii) Name- CHINMAY RAJ SHAH

Section- H

Roll number- 50

University Roll number- 2016711

Enter Range : 2 3

Invalid Range.

**PROGRAM 4:**

/\* Name- CHINMAY RAJ SHAH

Section- H

Roll number- 50

University Roll number- 2016711

\*/

#include <stdio.h>

double function(double x)

{

return x \* x-2\*x;

}

double diff(double x)

{

return 2 \* x-2;

}

int main()

{printf(“Name: CHINMAY RAJ SHAH\n Section: H\n Class roll number: 50\n University roll number: 2016711\n ”);

double a, c, fc;

printf("Enter Initial Guess : ");

scanf("%lf", &a);

c = a;

fc = function(c);

while(fc < -0.001 || fc > 0.001)

{

printf("x = %lf, function(x) = %lf\n", c, fc);

c = c - (fc / diff(c));

fc = function(c); }

printf("Final value of x = %lf, function(x) = %lf\n", c, fc);

return 0;}

**OUTPUT:**

Name- CHINMAY RAJ SHAH

Section- H

Roll number- 50

University Roll number- 2016711

Enter Initial Guess : 3

x = 3.000000, function(x) = 3.000000

x = 2.250000, function(x) = 0.562500

x = 2.025000, function(x) = 0.050625

Final value of x = 2.000305, function(x) = 0.000610

**PROGRAM 5:**

/\* Name- CHINMAY RAJ SHAH

Section- H

Roll number- 50

University Roll number- 2016711\*/

#include <stdio.h>

#include <stdlib.h>

void mul(double \*\*mat, int from, int to, int w, double fact)

{

for(int i = 0; i< w; i++)

mat[to][i] += fact \* mat[from][i];

}

int main()

{

printf(“Name: CHINMAY RAJ SHAH\n Section: H\n Class roll number: 50\n University roll number: 2016711\n ”);

int n;

printf("Enter Number of variables : ");

scanf("%d", &n);

double \*\*mat = (double\*\*) calloc(n, sizeof(double\*));

for(int i = 0; i< n; i++)

mat[i] = (double\*) calloc(n + 1, sizeof(double));

printf("Enter augmented matrix :- \n");

for(int i = 0; i< n; i++)

for(int j = 0; j < n + 1; j++)

scanf("%lf", &mat[i][j]);

for(int i = 0; i< n; i++)

for(int j = i + 1; j < n; j++)

if(mat[i][i] && mat[j][i])

mul(mat, i, j, n + 1, -(mat[j][i] / mat[i][i]));

printf("Upper Triangular matrix :-\n");

for(int i = 0; i< n; i++)

{

for(int j = 0; j < n + 1; j++)

printf("%0.2lf ", mat[i][j]);

printf("\n");

}

if(mat[n - 1][n - 1])

mat[n - 1][n] /= mat[n - 1][n - 1];

for(int i = n - 2; i>= 0; i--)

{

double sum = 0;

for(int j = i + 1; j < n; j++)

sum += mat[j][n] \* mat[i][j];

mat[i][n] -= sum;

if(mat[i][i])

mat[i][n] /= mat[i][i];

}

printf("Roots : ");

for(int i = 0 ; i< n; i++)

printf("%0.2lf ", mat[i][n]);

return 0;

}

**OUTPUT:**

Name- CHINMAY RAJ SHAH

Section- H

Roll number- 50

University Roll number- 2016711

Enter Number of variables : 3

Enter augmented matrix :-

2 -1 3 9

1 1 1 6

1 -1 1 2

Upper Triangular matrix :-

2.00 -1.00 3.00 9.00

0.00 1.50 -0.50 1.50

0.00 0.00 -0.67 -2.00

Roots : 1.00 2.00 3.00

**PROGRAM 6:**

/\* Name- CHINMAY RAJ SHAH

Section- H

Roll number- 50

University Roll number- 2016711\*/

#include <stdio.h>

#include <stdlib.h>

void mul(double \*\*mat, int from, int to, int w, double fact)

{

for(int i = 0; i< w; i++)

mat[to][i] += fact \* mat[from][i];

}

int main()

{

printf(“Name: CHINMAY RAJ SHAH\n Section: H\n Class roll number: 50\n University roll number: 2016711\n ”);

int n;

printf("Enter Number of variables : ");

scanf("%d", &n);

double \*\*mat = (double\*\*) calloc(n, sizeof(double\*));

for(int i = 0; i< n; i++)

mat[i] = (double\*) calloc(n + 1, sizeof(double));

printf("Enter augmented matrix :- \n");

for(int i = 0; i< n; i++)

for(int j = 0; j < n + 1; j++)

scanf("%lf", &mat[i][j]);

for(int i = 0; i< n; i++)

for(int j = 0; j < n; j++)

if(i != j && mat[i][i] && mat[j][i])

mul(mat, i, j, n + 1, -(mat[j][i] / mat[i][i]));

printf("Diagonal matrix :-\n");

for(int i = 0; i< n; i++)

{

for(int j = 0; j < n + 1; j++)

printf("%lf ", mat[i][j]);

printf("\n");

}

printf("Roots are : ");

for(int i = 0; i< n; i++)

{

if(mat[i][i])

mat[i][n] /= mat[i][i];

printf("%lf ", mat[i][n]);

}

return 0;

}

**OUTPUT:**

Name- CHINMAY RAJ SHAH

Section- H

Roll number- 50

University Roll number- 2016711

Enter Number of variables : 3

Enter augmented matrix :-

2 -1 3 9

1 1 1 6

1 -1 1 2

Diagonal matrix :-

2.000000 0.000000 0.000000 2.000000

0.000000 1.500000 0.000000 3.000000

0.000000 0.000000 -0.666667 -2.000000

Roots are : 1.000000 2.000000 3.000000