Jesus and Mary College
University of Delhi
Chanakyapuri, New Delhi - 110021
Accredited by NAAC with A+ Grade

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JESUS AND MARY COLLEGE

DELHI UNIVERSITY

Supporting Document for 2.5.1

Mechanism of Internal Assessment

Metric space

Test (chapter-1)

Imp. Instructions:

Do any four questions. (Max. marks: 20)

Q1. Let (X,d) be a metric space. Define and discuss a metric 'e' on X s.t $e(x,y) \leq 1$, $\forall\, x,y \in X$. (using metric d) (5)

Q2. Let $X = [-1,1]$
Define $d(x,y) = |\sin^{-1}x - \sin^{-1}y|$, $\forall\, x,y \in X$
Show that (X,d) is a metric space. (5)

Q3. Define a pseudometric space, (X,d).
Is it a metric space? Justify. (5)

Q4. Let $X = \ell_p$, $p \geq 1$
and $d(x,y) = \left(\sum_{k=1}^{\infty} |x_k - y_k|^p\right)^{1/p}$, where $x = \langle x_k \rangle_{k\geq 1}$
and $y = \langle y_k \rangle_{k\geq 1}$. Let $\langle x^{(n)} \rangle_{n\geq 1} = \langle \langle x_k^{(n)} \rangle_{k\geq 1} \rangle_{n\geq 1}$
be a sequence in X s.t $x^{(n)} \to x$, $x \in \ell_p$
Show that $x^{(n)} \to x$ coordinatewise. Is the converse true? Justify. (5)

Q5. Let (X,d) be a metric space.
Define a cauchy sequence, $\langle x_n \rangle$ in X.
State and prove a sufficient condition for the convergence of $\langle x_n \rangle$ in X. (5)

Q6. Let $X = \mathbb{R}^n$ and $d_p(x,y) = \left(\sum_{i=1}^{n} |x_i - y_i|^p\right)^{1/p}$, $p \geq 1$
Assuming (X,d_p) is a complete metric space, show that (X,d_∞) is a complete metric space
[$d_\infty(x,y) = \max\{|x_i - y_i| : 1 \leq i \leq n\}$,
$x = (x_1, x_2 \cdots x_n)$ & $y = (y_1, y_2 \cdots y_n)$]. (5)

9/10 good!

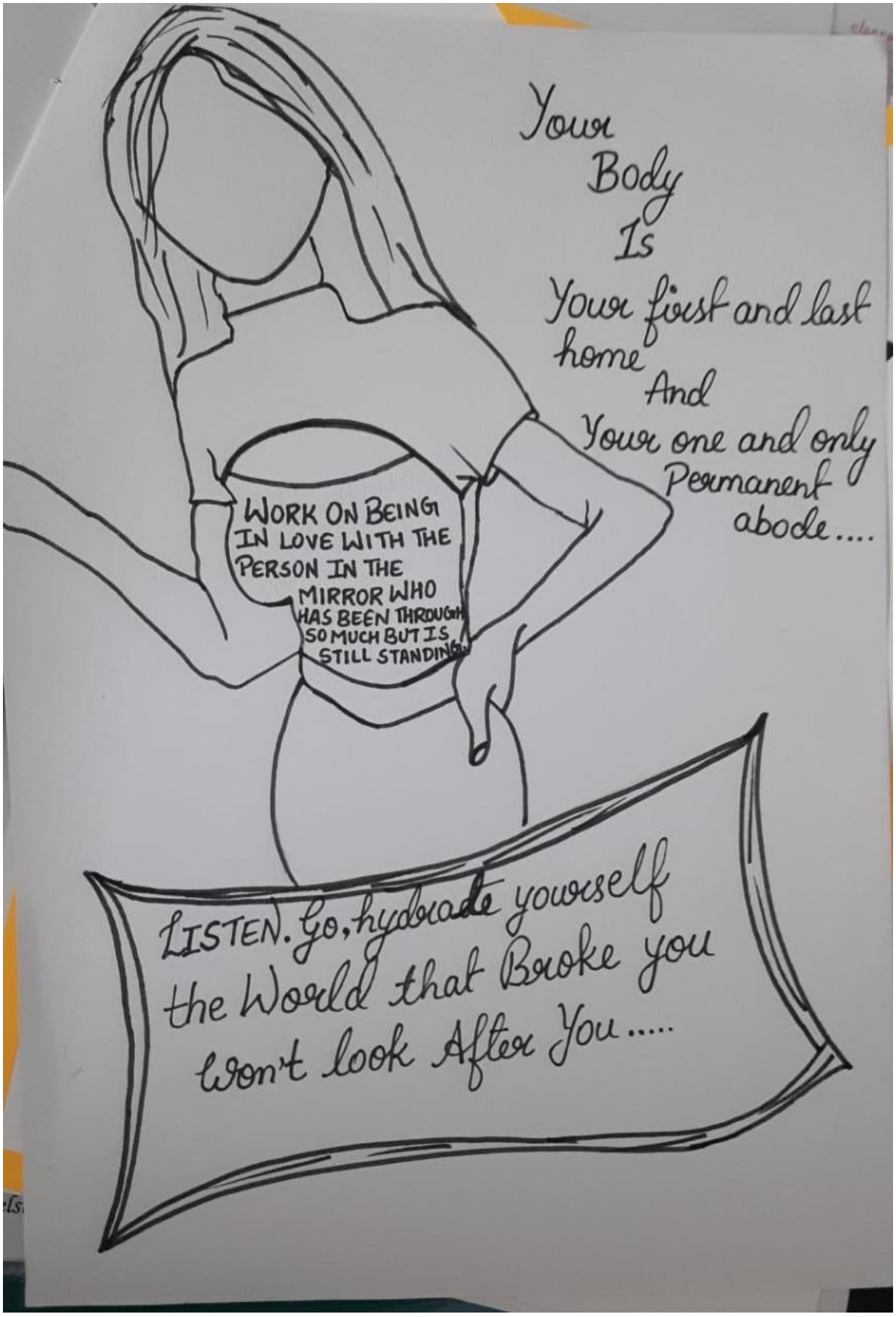
Psychology Assignment

Submitted to :- Bettina Ma'am

Submitted by :- Kesia Sara Thomas

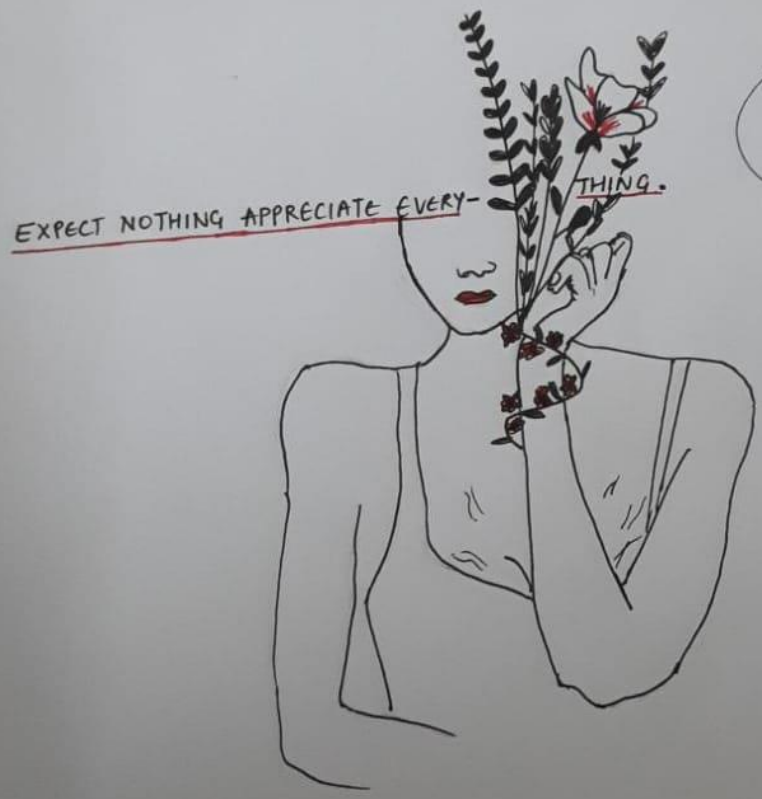
Roll no. :- 201397

Combination : B.A. (Prog.) CA - Adv.


Your
Body
Is
Your first and last
home
And
Your one and only
Permanent
abode....
WORK ON BEING
IN LOVE WITH THE
PERSON IN THE
MIRROR WHO
HAS BEEN THROUGH
SO MUCH BUT IS
STILL STANDING.
LISTEN. Go, hydrate yourself
the World that Broke you
won't look After You.....

PSYCHOLOGY

Assignment



EXPECT NOTHING APPRECIATE EVERY-THING.

8½/10

By:
Manisha Panna
200363
~ BETINA MA'AM

what i think is Dream is our own and it definitely looks beautiful on us just like flowers looks beautiful in garden. In the same sense flaws can be beautful and is beautful.

2)

Dreamer (queen)

Complex Practical Assignment

Name: Ananya Lohani

Year: 3rd year

Roll no. 190301

Ans 1.

Editor Window

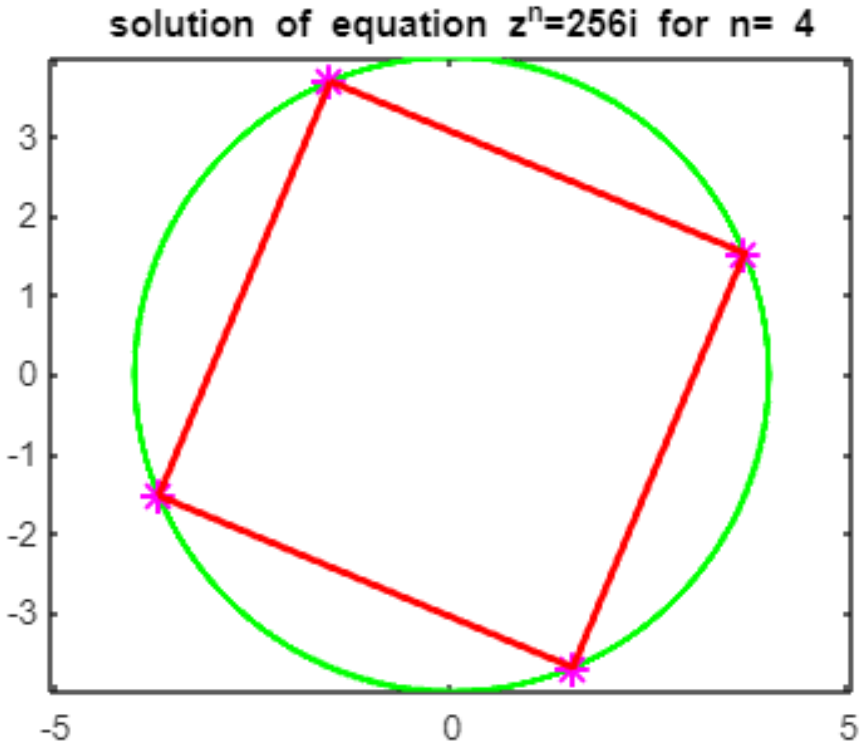
```
function  nth_root
n=input ('Enter the value of n');
syms w
[z] =solve(w^(n)-256i==0)%solving equation and obtaining roots
t=0:0.001:2*pi;
for k=1:n
x=(256.^(1./k)).*cos(t);
y=(256.^(1./k)).*sin(t);
end
plot(x,y,'g','LineWidth',2)
axis equal
axis square % axis gap same for both axis
hold on
plot(z,'m*','LineWidth',1.5,'MarkerSize',10)
str2= [' solution of equation z^n=256i for n= ' num2str(n)];
title(str2)
hold on
x1=real(z);
y1=imag(z);
z1=double(z);
th =angle(z1)
theta=sort(th)
for k=1:n
z2=complex((256.^(1./k)).*cos(theta),(256.^(1./k)).*sin(theta));
end
plot(z2, 'r','LineWidth', 2)
hold on
plot([z2(1) z2(n)],'r','LineWidth', 2)
axis equal
hold off
for i=1:n-1
    diff=theta(i+1)-theta(i)
    diff=rad2deg(diff)
end
```

Command Window

```
>> nth_root
Enter the value of n
4

z =

- 2*(2^(1/2) + 2)^(1/2) - (2 - 2^(1/2))^(1/2)*2i
```

```
  2*(2^(1/2) + 2)^(1/2) + (2 - 2^(1/2))^(1/2)*2i
  2*(2 - 2^(1/2))^(1/2) - (2^(1/2) + 2)^(1/2)*2i
  (2^(1/2) + 2)^(1/2)*2i - 2*(2 - 2^(1/2))^(1/2)


th =

   -2.7489
    0.3927
   -1.1781
    1.9635


theta =

   -2.7489
   -1.1781
    0.3927
    1.9635


diff =

    1.5708


diff =

    90


diff =

    1.5708


diff =

    90


diff =

    1.5708


diff =

   90.0000
```

Graph

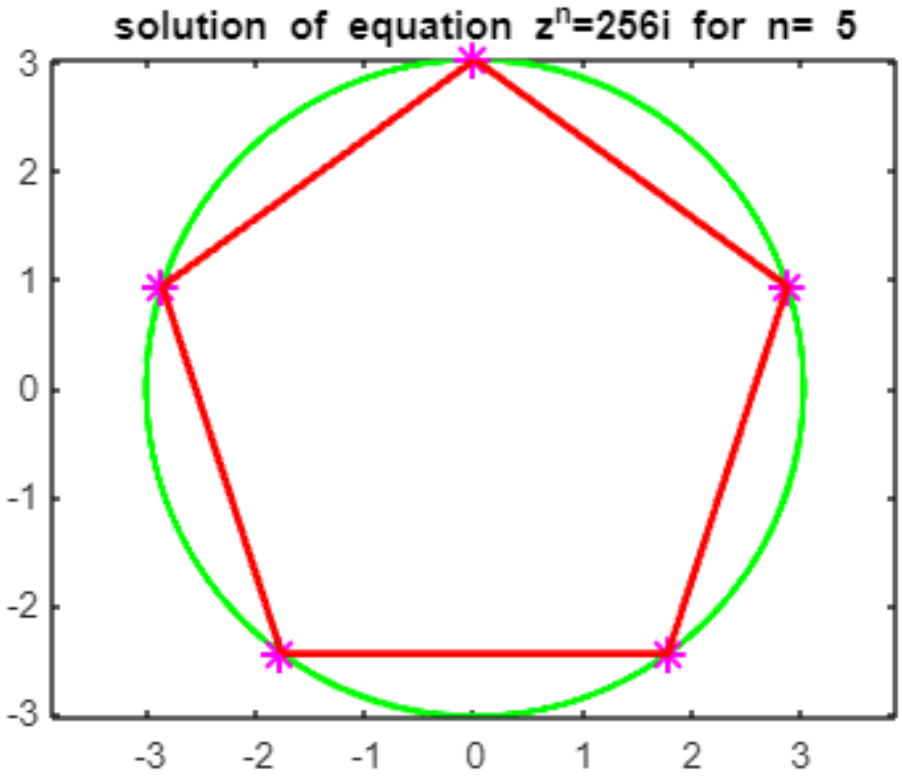


for n=5

```
>> nth_root
Enter the value of n
5

z =


256^(1/5)*(5^(1/2)/4 - 1/4)*1i + (2^(1/2)*256^(1/5)*(5^(1/2) + 5)^(1/2))/4

256^(1/5)*1i

256^(1/5)*(5^(1/2)/4 - 1/4)^2*1i - (256^(1/5)*(5^(1/2) + 5)*1i)/8 +
(2^(1/2)*256^(1/5)*(5^(1/2)/4 - 1/4)*(5^(1/2) + 5)^(1/2))/2
(2^(1/2)*256^(1/5)*(5^(1/2)/4 - 1/4)*(5 - 5^(1/2))^(1/2))/4 -
256^(1/5)*(5^(1/2)/4 - 1/4)*(5^(1/2)/4 + 1/4)*1i -
(2^(1/2)*256^(1/5)*(5^(1/2)/4 + 1/4)*(5^(1/2) + 5)^(1/2))/4 - (256^(1/5)*(5 -
5^(1/2))^(1/2)*(5^(1/2) + 5)^(1/2)*1i)/8
(256^(1/5)*(5 - 5^(1/2))^(1/2)*(5^(1/2) + 5)^(1/2)*1i)/8 -
256^(1/5)*(5^(1/2)/4 - 1/4)*(5^(1/2)/4 + 1/4)*1i -
(2^(1/2)*256^(1/5)*(5^(1/2)/4 + 1/4)*(5^(1/2) + 5)^(1/2))/4 -
(2^(1/2)*256^(1/5)*(5^(1/2)/4 - 1/4)*(5 - 5^(1/2))^(1/2))/4


th =

    0.3142
    1.5708
   -0.9425
   -2.1991
    2.8274
```

```
theta =

   -2.1991
   -0.9425
    0.3142
    1.5708
    2.8274


diff =

    1.2566


diff =

    72


diff =

    1.2566


diff =

    72


diff =

    1.2566


diff =

    72


diff =

    1.2566


diff =

    72
```

Graph



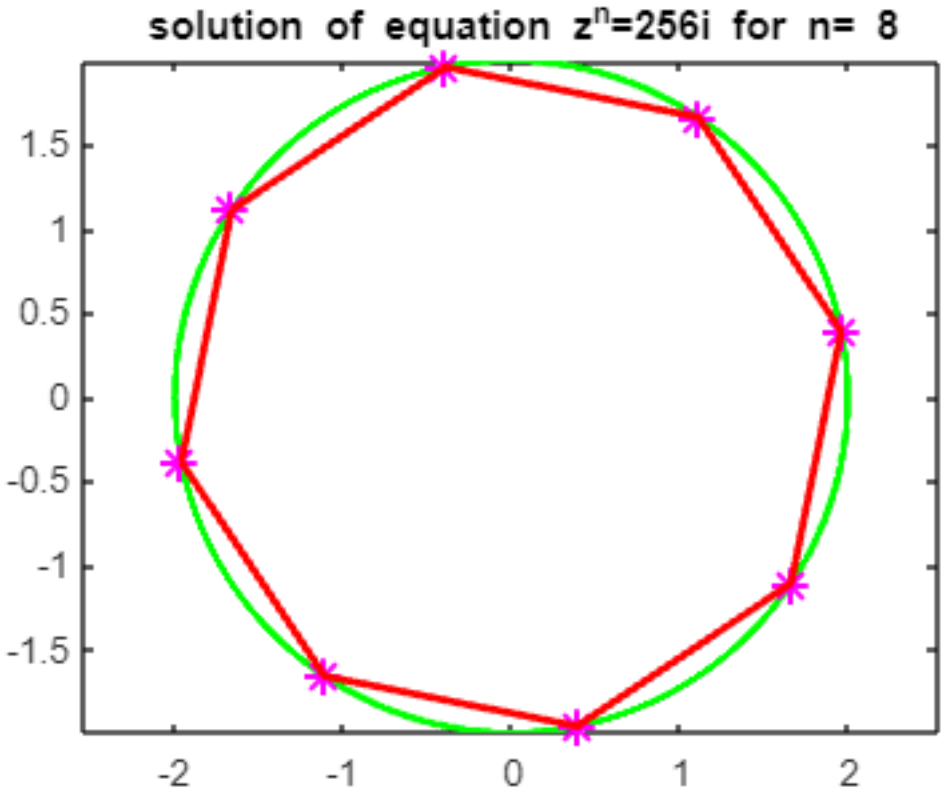
For n=8

```
>> nth_root
Enter the value of n
8

z =

- 2^(1/2)*cos(pi/16)*(1 + 1i) + 2^(1/2)*sin(pi/16)*(1 - 1i)
- 2^(1/2)*cos(pi/16)*(1 - 1i) - 2^(1/2)*sin(pi/16)*(1 + 1i)
  2^(1/2)*cos(pi/16)*(1 - 1i) + 2^(1/2)*sin(pi/16)*(1 + 1i)
  2^(1/2)*cos(pi/16)*(1 + 1i) - 2^(1/2)*sin(pi/16)*(1 - 1i)
                              - 2*cos(pi/16) - sin(pi/16)*2i
                                2*cos(pi/16) + sin(pi/16)*2i
                                2*sin(pi/16) - cos(pi/16)*2i
                                cos(pi/16)*2i - 2*sin(pi/16)


th =

   -2.1598
    2.5525
   -0.5890
    0.9817
   -2.9452
    0.1963
   -1.3744
    1.7671
```

```
theta =

   -2.9452
   -2.1598
   -1.3744
   -0.5890
    0.1963
    0.9817
    1.7671
    2.5525


diff =

    0.7854


diff =

   45.0000


diff =

    0.7854


diff =

   45.0000


diff =

    0.7854


diff =

    45


diff =

    0.7854


diff =

    45


diff =

    0.7854
```

```
diff =

   45.0000

diff =

    0.7854

diff =

   45.0000

diff =

    0.7854

diff =

    45
```

Graph



Ans 2.

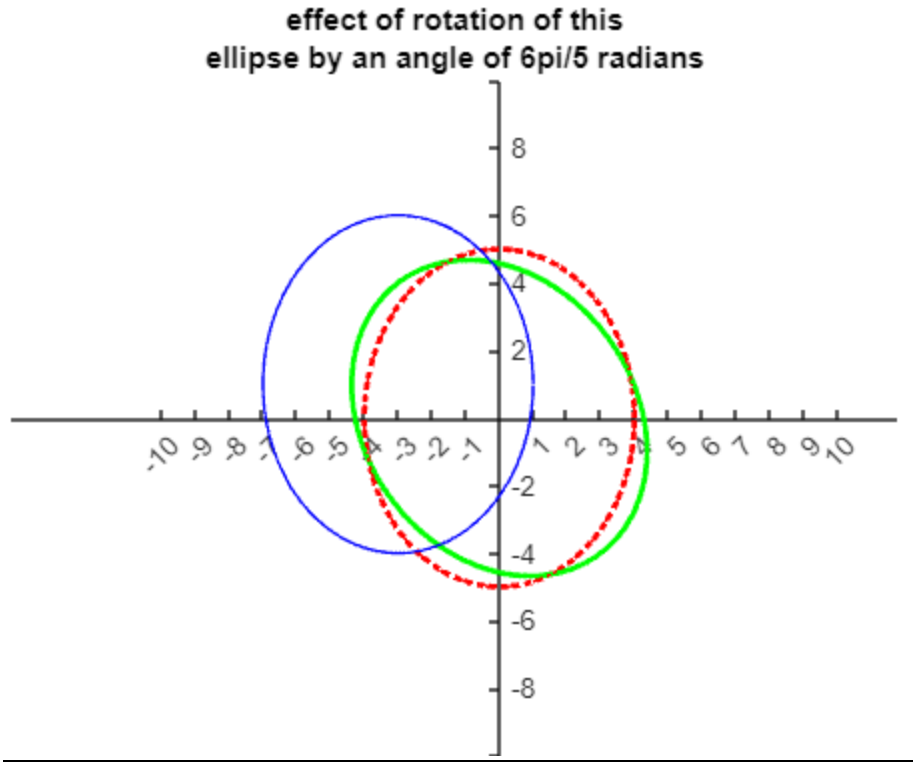
Editor Window

```
%% Parametric equations and parametric plot for an ellipse
%% An ellipse centered at the origin with horizontal major axis of 4 units and
vertical minor axis of 2 units is given by

t=0:0.01:2*pi;
xt= 4.*cos(t); % parametric equation of ellipse
yt= 5.*sin(t);
plot(xt,yt,'r:',LineWidth=2)% plotting of ellipse
axis equal
set(gca, 'XAxisLocation', 'origin', 'YAxisLocation', 'origin','box', 'off')
% in order to break title between lines just separate them by comma and
% write whole expression in curly brackets
xlim([-10 10])%Range of x axis
xticks(-10:1:10)
%xticklabels({'x = -2','x = -1','x = 0','x = 1','x = 2'})
ylim([-10 10])% range of yaxis
hold on

%% effect of rotation of this ellipse by an angle of 6pi/5 radians

z=xt+i*yt; %complex numbers corresponding to parametric plot
w=z.*exp(i*(6.*pi/5));% coordinates after rotation via angle 6pi/5
% plotting of orginal and rotated ellipse
plot(xt,yt,'r:',real(w),imag(w),'g',LineWidth=2)
axis equal
set(gca, 'XAxisLocation', 'origin', 'YAxisLocation', 'origin','box', 'off')
title({'effect of rotation of this', 'ellipse by an angle of 6pi/5 radians'})
xlim([-10 10])
xticks(-10:1:10)
ylim([-10 10])
hold on
%% effect of shifting of the centre from (0,0) to (-3,1)
s=z-3+1i;
plot(xt,yt,'r:',real(s),imag(s),'b',LineWidth=1)
axis equal
set(gca, 'XAxisLocation', 'origin', 'YAxisLocation', 'origin','box', 'off')
%title({'effect of shifting centre', 'from (0,0) to (-3,1)'})
```

Command Window

```
>> ellipse
```

Graph



Ans 3.

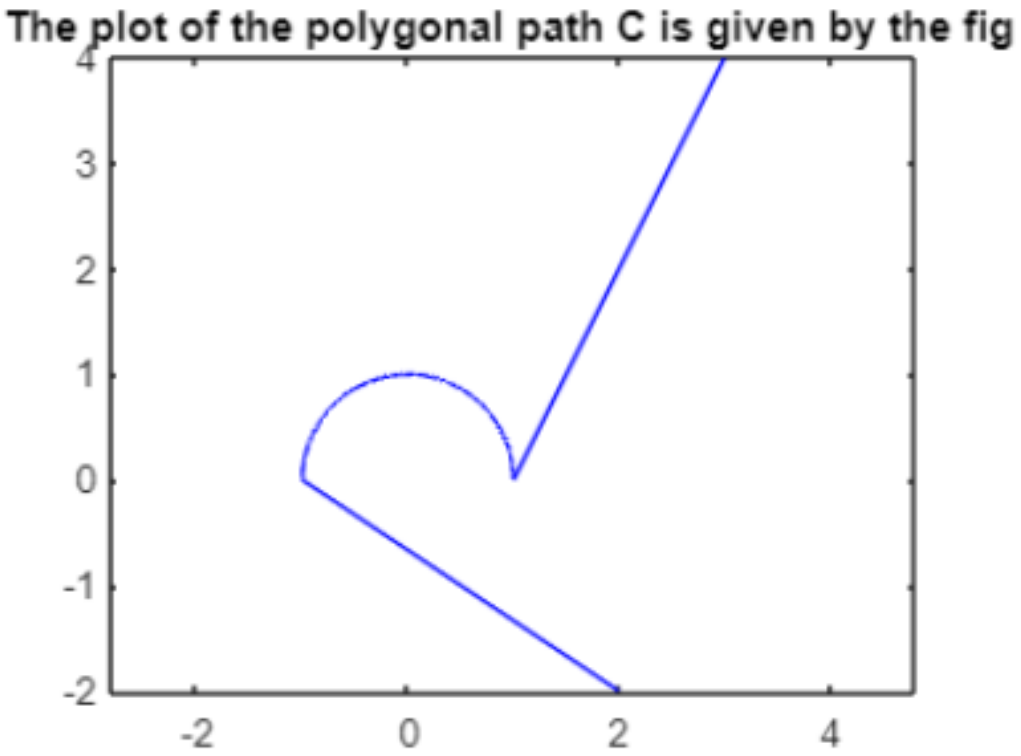
Editor Window

```
syms t
w1=2-2*i;
w2=-1;
w3=1;
w4=3+4*i;
z1(t)=(1-t).*w1+t.*w2;
th=0:0.001:pi;
z2=cos(th)+i*sin(th);
z3(t)=(1-t).*w3+t.*w4;
t=0:0.01:1;
plot(z1(t),'b')
hold on
plot(z2,'b')
hold on
plot(z3(t),'b')
xlim([-2,3])
axis equal
title('The plot of the polygonal path C is given by the fig.')
```

Command window

>> para_poly

Graph



Ans 4.

Editor Window

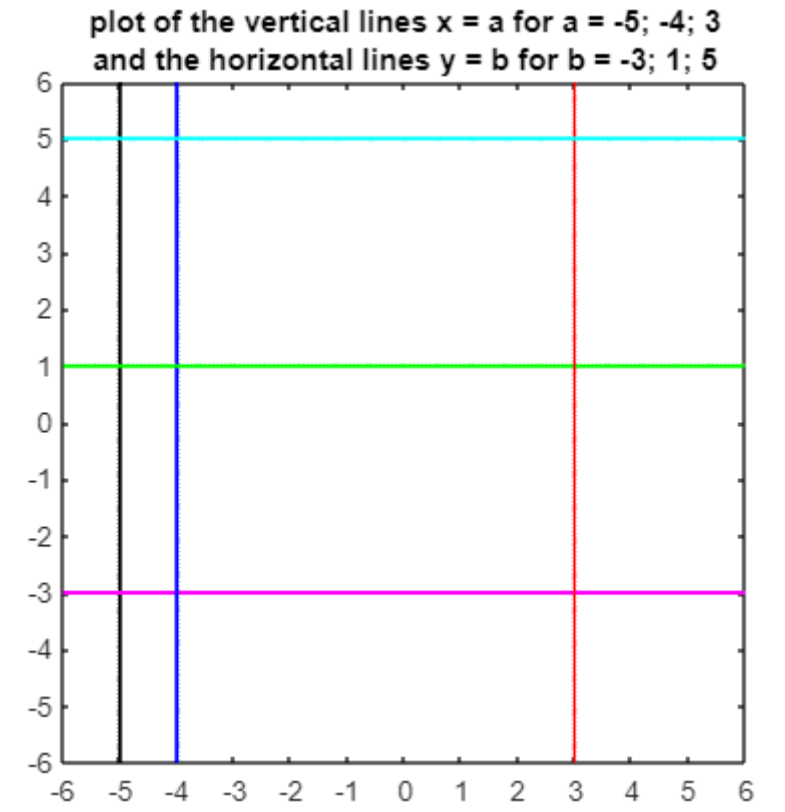
```
[x, y] = meshgrid(-50:.01:50);% grid of points
grid1= [-5; -4; 3];%column vector for possible values of a
grid2= [-3;1;5];
xcol = {'k','b','r'};% Choice of colours
ycol = {'m','g','c'};% choice of colours
syms s
f(s)=(3+4i)./(s-2i); % defining function
figure(1)
ax1 = axes('Box','on', 'xlim',[-6 6],'ylim',[-6 6],'xtick',(-6:1:6),'ytick',(-
6:1:6));
axis square
title(ax1,{'plot of the vertical lines x = a for a = -1, -1/2, 1/2, 1', 'and the
horizontal lines y = b for b = -1, -1/2, 1/2, 1.'});
% axis specification for grid plot
figure(2)
ax2 = axes('Box','on', 'xlim',[-6 6],'ylim',[-6 6],'xtick',(-6:1:6),'ytick',(-
6:1:6));
axis square
title(ax2,'the image plot of the grid under the mapping w = f(z) = (3+4i)./(z-
2i)');
% axis specification for images plot
hold([ax1 ax2],'on')
for k= 1:3
re=real(x+i*y)==grid1(k); % or re= x==grid(k);
im=imag(x+i*y)==grid2(k);%or im=y==grid(k);
plot(ax1,x(re),y(re),'color',xcol{k},LineWidth=1.5);
%or plot(x(re),y(re),LineWidth=1.5); % for any random colors
plot(ax1,x(im),y(im),'color',ycol{k},LineWidth=1.5);
```

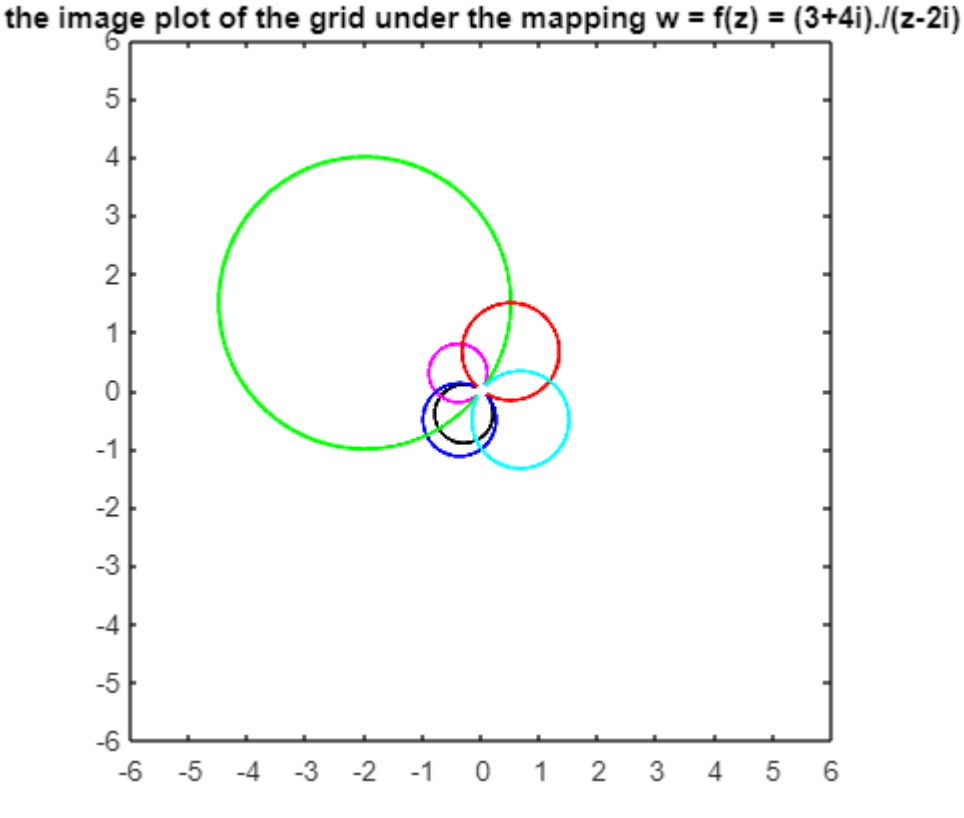
```
z1=x(re)+y(re)*i;% generating set of complex numbers
z2=x(im)+y(im)*i;
w1=f(z1);% images of z under mapping
w2=f(z2);%%mapping% generating set of points on the boundary of the region
plot(ax2,w1,'color',xcol{k},LineWidth=1.5);
%plotting image of interior points
plot(ax2,w2, 'color',ycol{k},LineWidth=1.5)% plotting image of bounday points
end
```

Command Window

>> plot_grid

Graph


plot of the vertical lines x = a for a = -5; -4; 3
and the horizontal lines y = b for b = -3; 1; 5
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6


the image plot of the grid under the mapping w = f(z) = (3+4i)./(z-2i)
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6

JESUS AND MARY COLLEGE

DELHI UNIVERSITY

PRACTICAL FILE

2022-23

HTML

SUBMITTED TO:

Ms. Rama Saxena

SUBMITTED BY:

Rishika Aggarwal

210402

Bsc. (H) Mathematics

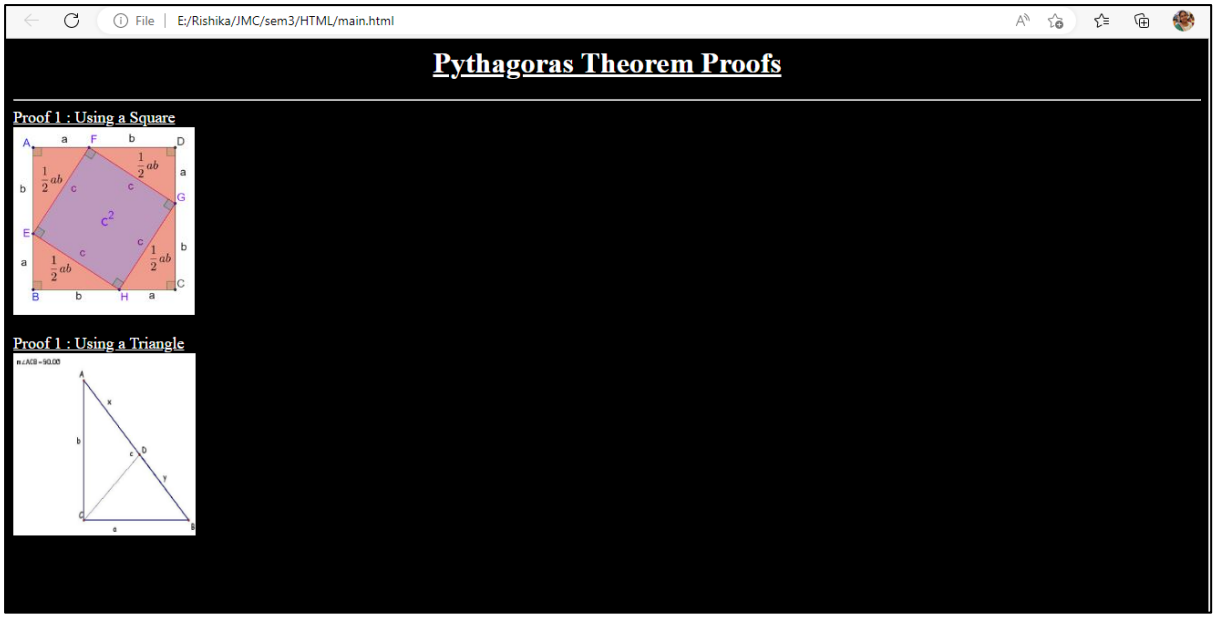
(III Semester)

QUESTION 1

PYTHAGORAS THEOREM

PAGE 1 : MAIN PAGE

```
<html>
<head>
<title> Main Page </title>
</head>
<body bgcolor='black'>
<center><u><font color='white'><h1>Pythagoras Theorem Proofs</h1></font></u></center>
<hr>
<font color='white' size=+1>
<u>Proof 1 : Using a Square</u><br>
<a href="proof1.html"> <img src='proof1.jpg'/></a><br><br>

<u>Proof 1 : Using a Triangle</u><br>
<a href = "proof2.html"><img src='proof2.jpg' height="200" width="200"/></a><br><br>
</font>
</body>
</html>
```



PAGE 2: PROOF 1

```
<html>
<head>
<title>Proof 1</title>
</head>

<body bgcolor='black'>

<center><u><font color='white'><h1>Proof 1</h1></font></u></center>
<hr>
<center><img src='proof1.jpg' height="300" width="300"/></center><br>
<font color='white' size=+1>
Area of square ABCD = (a+b)<sup>2</sup><br>
Area of 4 triangles = 4(1/2 ab) = 2ab<br>
Area of square EFGH = c<sup>2</sup><br>
<br>
Area of ABCD = Area of EFGH + Area of triangles<br>
```

(a+b)² = c²+2ab

(a+b)(a+b) = c²+2ab

a²+2ab+b² = c²+2ab

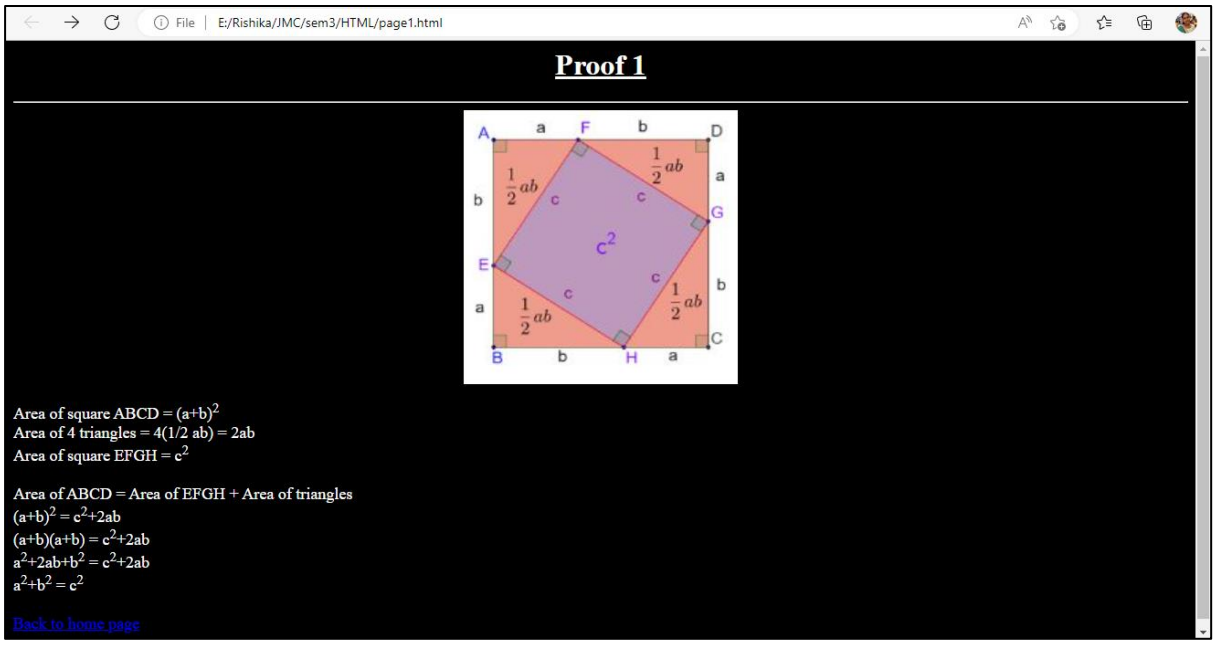
a²+b² = c²

Back to home page

</p>

</body>

</html>



PAGE 3: PROOF 2

<html>

<head>

<title>Proof 2</title>

</head>

<body bgcolor='black'>

<u><h1>Proof 1</h1></u>

<hr>

(c/a)=(a/x) which becomes a²=cx and

(c/b)=(b/x) which becomes b²=cx and

From the addition property of equations in algebra, we get the following equation:

a²+b² = cx+cy

Factor out the c on the right side,

a²+b² = c(x+y)

But x+y=c, by the segment addition postulate.

So, a²+b² = (c)(c)

or

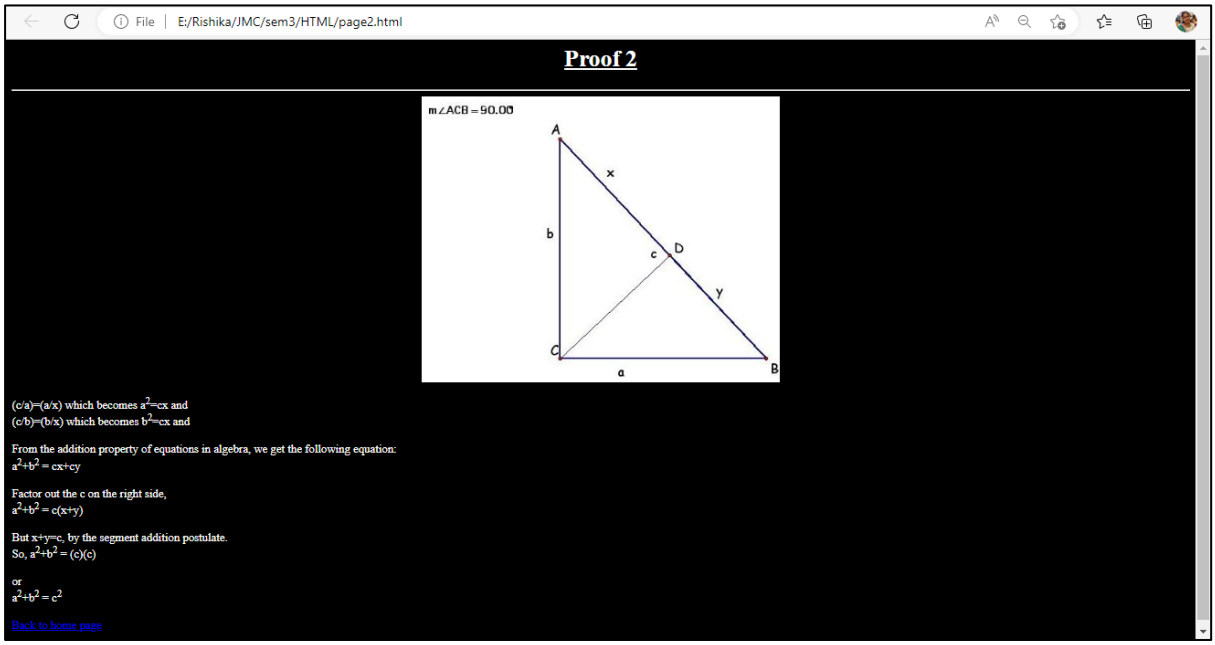
a²+b² = c²

Back to home page

</p>

</body>

</html>



QUESTION 2

3D FIGURE

```
<html>
<head>
<title>3D FIGURE</title>
</head>
<body>
<h1 style="background-color:LightBlue;">ELLIPTIC PARABOLOID</h1>
<hr>
<center><img src="paraboloid.jpg" height=400 width=600 /></center>
<br>
<font size=+1>
<i>Paraboloid</i> is an open surface generated by rotating a parabola about its axis. <br><br>
```

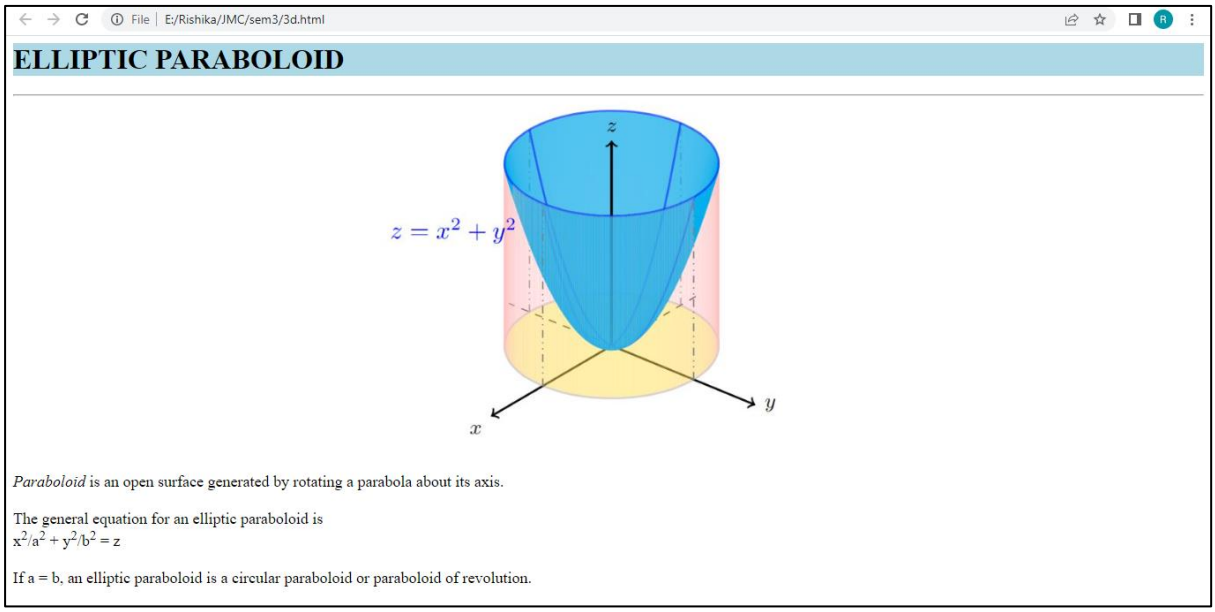
The general equation for an elliptic paraboloid is

x²/a² + y²/b² = z

If a = b, an elliptic paraboloid is a circular paraboloid or paraboloid of revolution.

</body>

</html>



QUESTION 3

CV/RESUME

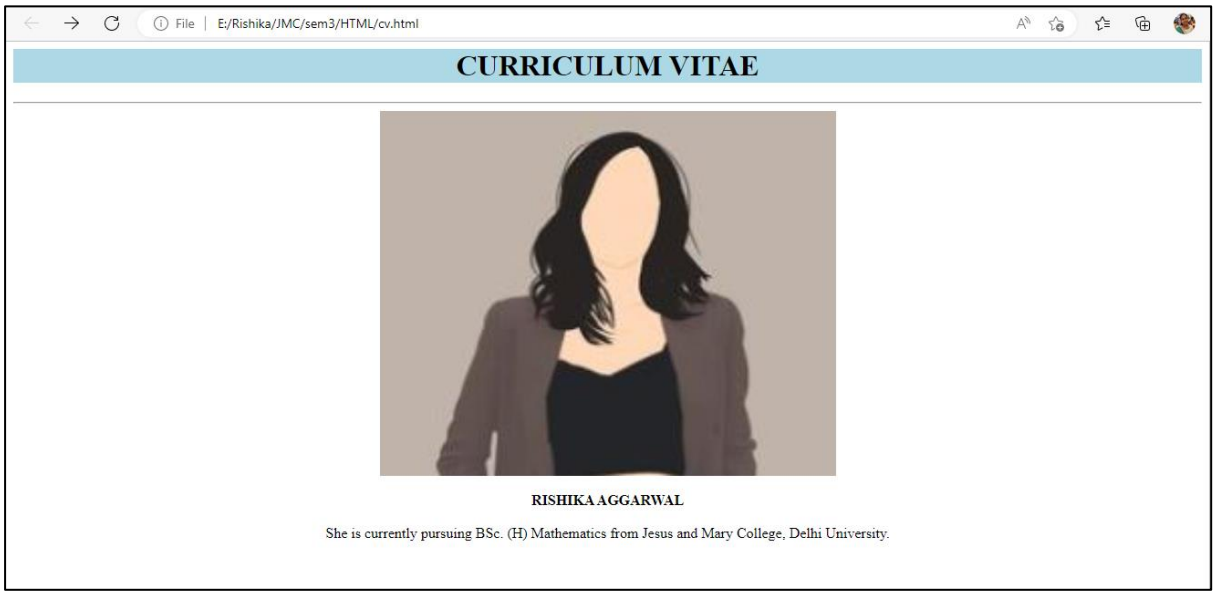
<html>

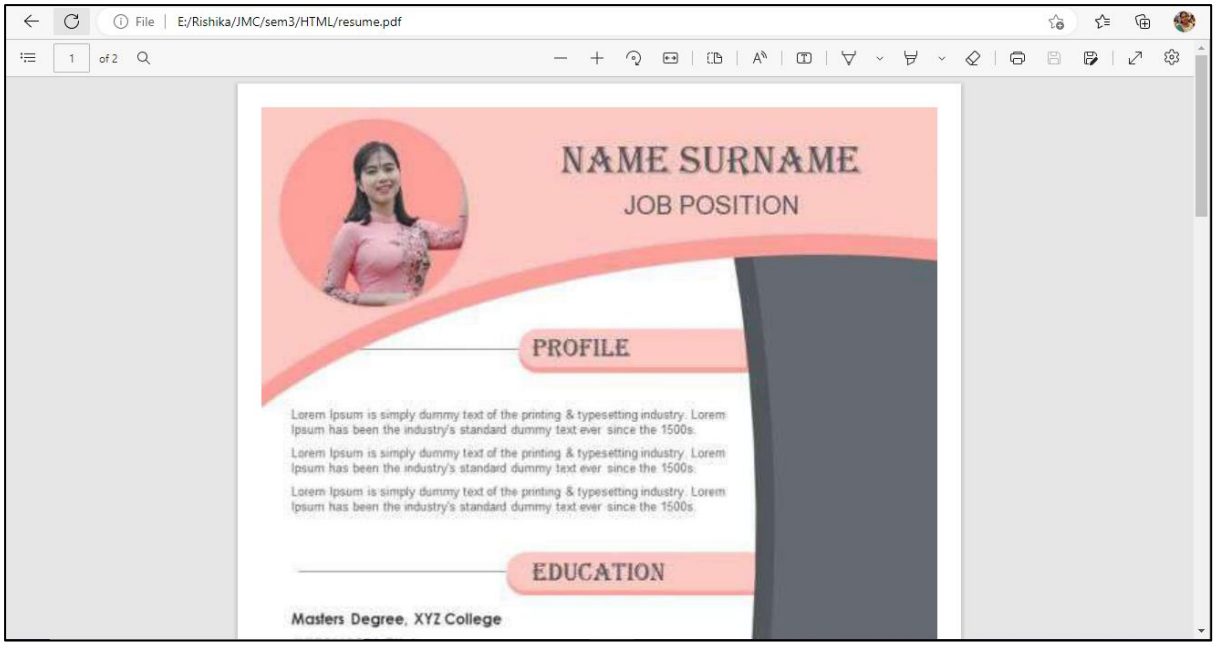
<head>

<title>RESUME</title>

</head>

```
<body>

<center><h1 style="background-color:LightBlue;">CURRICULUM VITAE</h1></center>

<hr>

<center><a href="resume.pdf"><img src="cv.jpg" width="500" height="400"></a>

<br><br>

<b>RISHIKA AGGARWAL</b><br><br>

She is currently pursuing BSc. (H) Mathematics from Jesus and Mary College, Delhi University.


</center>

</body>

</html>
```





QUESTION 4

BLACK GOOSE BISTRO

```
<html>
<head>
<title>Black Goose Bistro</title>
</head>

<body>
<center><img src="bgblogo.png"/><br>
<font face="Calibri">
<b><font color="DarkBlue" size="6">Black Goose Bistro</font></b>
</center>
<hr>
<b><font color="Red" size="4">THE RESTAURANT</font></b><br><br>
The Black Goose Bistro offers lunch and dinner in a good ambience.
```

The menu changes regularly to highlight the freshest ingredients.

CATERING

You have FUN... we'll handle the cooking.

Black Goose Catering can handle events from snacks for kitty parties to elegant corporate lunces.

LOCATION AND HOURS

Black K, Cannaught Place, New Delhi;

Monday through Thursday 11am to 11pm,

Friday and Saturday, 11am to midnight

</body>

</html>