%% 1a) Find the zeros of the function and its asymptotes

syms x

f=x; %function

%Finding zeros

solve(f,x);

zero=1; %for example the intersection point;

subs(f,x,zero); %subsitute x on f by the point to calculate its image

%Asymptotes

%vertical:limits on the points out of domain. x=a

out\_domain=1;

Left\_limit=limit(f,x,out\_domain,'left'); %can be inf or -inf

Right\_limit=limit(f,x,out\_domain,'right'); %can be inf or -inf

%to draw vertical lines: fplot([a a],interval);

%horizontal: limits on inf and -inf. horizontal\_asymptote=b

Limit\_Right\_inf=limit(f,x,inf); %inf, -inf or b

Limit\_Left\_inf=limit(f,x,-inf); %inf, -inf or b

%oblique: y=mx+n

Limit\_Right\_m=limit(f/x,x,inf); %value of the scope, different from 0

Limit\_Right\_n=limit(f-Limit\_Rm\*x,x,inf);

Limit\_Left\_m=limit(f/x,x,-inf);

Limit\_Left\_n=limit(f-Limit\_Lm\*x,x,-inf);

%% 1b) Calculate local max and local min, and decreasing, increasing

df=diff(f,x); %first derivative

critical\_points=solve(df,x); %Example.Sol: c

%then calculate their image: subs(f,x,c)

%Study the sign of df on the monotonicity intervals

%DONT FORGET TO STUDY ALSO DOMAIN

subs(df,x,c-0.5) %+ or - (left from c)

subs(df,x,c+0.5) %+ or - (right from c)

% + and -: maximum; - and +: minimum; + and + or - and -: inflexion point

%f increase(+) from interval\_1 and decrease(-) from interval\_2

%% 1c) Study concavity

d2f=diff(f,x,2); %second derivative

inflexion\_points=solve(d2f,x); %Example.Sol: d

%then calculate their image: subs(f,x,d)

%study sign of d2f

%DONT FORGET TO STUDY ALSO DOMAIN

subs(d2f,x,d-0.5) %+ or - (left from d)

subs(d2f,x,d+0.5) %+ or - (right from d)

%f is concave down (-) in interval\_1 and concave up (+) in interval\_2

%% 1d) Plot the function in a suitable interval to see all its features

fplot(f,[h g]); %draws f in the interval [h,g]

%% 2a) Draw of the graph of g=(2-x^2)^(1/2), the y-axis and y=x in the first quadrant

syms x

g=(2-x^2)^(1/2);

fplot(g,[-5 5])

hold on

fplot([0 0],[-5 5])

fplot(x, [-5 5])

%% 2b) Calculate the area

a=0;

b=solve(g-x,x);

area=int(g-x,x,a,b);

%% 2c) Calculate the volume generated by revolving this region about the x-axis on (a,b).

volume\_x=abs(pi\*int((g-x)^2,a,b));

%% d) Calculate the volume generated by revolving the same region about the y-axis (a,b).

volume=abs(2\*pi\*int(x\*(g-x),a,b));