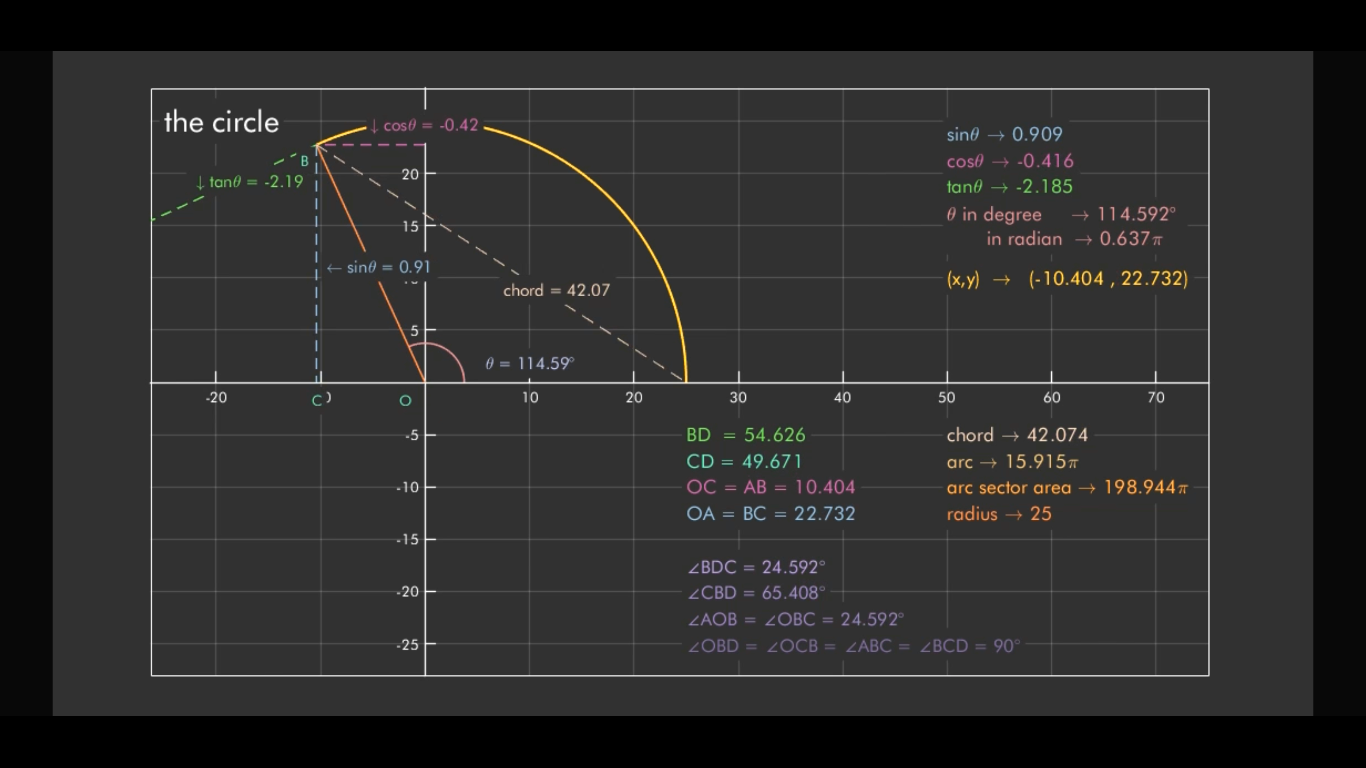
the circle

The figure is simulated in MATLAB 2018b.

Data visualization: <https://streamable.com/dya9>r



Degree,

Chord =

Chord is the connecting line for any two points on a circle; highest at radius.

Arc =

Arc sector area =

The code: (written in MATLAB)

clearvars

close(gcf)

r=input('Enter the radius of the circle: ');

increment=input('Enter the increment of the angle i.e. 0.1 or 0.01 etc: ');

ax=gca;

set(ax,'ClippingStyle','rectangle','Color',...

[0.149019607843137 0.149019607843137 0.149019607843137],'FontName',...

'Futura Bk BT','GridColor',[1 1 1],'LabelFontSizeMultiplier',2.5,...

'LineWidth',0.5,'MinorGridAlpha',0.5,'MinorGridColor',[1 1 1],...

'TitleFontSizeMultiplier',3,'XAxisLocation','origin','XColor',...

[1 1 1],'XGrid','on',...

'YAxisLocation','origin','YColor',...

[1 1 1],'YGrid','on');

box(ax,'on');

axis(ax,'square');

ax.FontSmoothing = 'on';

ax.LineWidth = 1;

ax.NextPlot = 'add';

set(gcf,'windowstate','maximized');

set(ax,'dataaspectratio',[1 1 1]);

t=0:increment:2\*pi;

if r<=-1

r=-r;

end

x=r\*cos(t);

y=r\*sin(t);

chord=2\*r\*sin(t/2);

set(ax,'xlim',[-(r+r\*.05) (r+2\*r)],'ylim',[-(r+r\*.125) (r+r\*.125)])

set(gcf,'color',[0.149019607843137 0.149019607843137 0.149019607843137])

pause(3)

for k=1:length(t)

rad(k)=(t(k)\*1)/pi; %radian

deg(k)=(rad(k)\*pi)\*(180/pi); %degree

m(k)=(y(k)/x(k)); %slope

b(k)=y(k)+(x(k)/m(k)); %the B of y=mx+b

p(k)=m(k)\*b(k);

s(k)=y(k)/r; %sine

c(k)=x(k)/r; %cosine

q(k)=s(k)/c(k); %tangent

circle=plot(ax,x(1:k),y(1:k),'yellow','linewidth',1.5);

inner\_circle=plot(ax,x(1:k)\*0.15,y(1:k)\*.15,'linewidth',1.1,'color',[227/255 140/255 128/255]);

radius=plot([0 x(k)],[0 y(k)],'color',[243/255 156/255 18/255],'linewidth',1.1);

sine\_plot=plot([x(k) x(k)],[y(k) 0],'color',[150/255 181/255 238/255],'linestyle','--','linewidth',1.1);

cosine\_plot=plot(ax,[0 x(k)],[y(k) y(k)],'color',[223/255 82/255 139/255],'linestyle','--','linewidth',1.1);

tangent\_plot=plot([x(k) p(k) ],[y(k) 0],'color',[79/255 241/255 103/255],'linestyle','--','linewidth',1.1);

chord\_plot=plot([x(k) r],[y(k) 0],'color',[235/255 212/255 167/255],'linestyle','--');

str\_theta=sprintf('\\theta = %.2f%c',deg(k),char(176));

str\_cosine=sprintf('\\downarrow cos\\theta = %.2f', c(k));

str\_sine=sprintf('\\leftarrow sin\\theta = %.2f',s(k));

str\_chord=sprintf('chord \\rightarrow %.3f',chord(k));

str\_chord1=sprintf('chord = %.2f',chord(k));

str\_b=sprintf('B');

str\_a=sprintf('A');

str\_c=sprintf('C');

str\_0=sprintf('O');

str\_d=sprintf('D');

if x(k)<0 && y(k)<0 || x(k)>0 && y(k)<0

str\_tangent=sprintf(' \\uparrow tan\\theta = %.2f',q(k));

else

str\_tangent=sprintf(' \\downarrow tan\\theta = %.2f',q(k));

end

length\_b=text(x(k)-r\*0.06,(y(k)-r\*0.06),str\_b,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',10,...

'FontName','Futura Bk BT',...

'Color',[94/255 240/255 224/255],'visible','on');

length\_a=text(-r\*.02,((y(k)+r\*0.06)),str\_a,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',10,...

'FontName','Futura Bk BT',...

'Color',[94/255 240/255 224/255],'visible','on');

length\_0=text(-r\*0.1,-r\*.07,str\_0,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',10,...

'FontName','Futura Bk BT',...

'Color',[94/255 240/255 224/255],'visible','on');

length\_c=text(x(k)-r\*0.02,(-r\*0.07),str\_c,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',10,...

'FontName','Futura Bk BT',...

'Color',[94/255 240/255 224/255],'visible','on');

length\_d=text(p(k),-r\*0.07,str\_d,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',10,...

'FontName','Futura Bk BT',...

'Color',[94/255 240/255 224/255],'visible','on');

if deg(k)>149 && deg(k)<169

angle\_data=text(r\*.23,-r\*.15/2,str\_theta,'Color',[197/255 180/255 241/255],'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],'FontSize',11,...

'FontName','Futura Bk BT');

else

angle\_data=text(r\*.23,r\*.15/2,str\_theta,'Color',[197/255 180/255 241/255],'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],'FontSize',11,...

'FontName','Futura Bk BT');

end

tangent\_data=text((x(k)+p(k)\*.20), y(k)\*.85,str\_tangent,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',11,...

'FontName','Futura Bk BT',...

'Color',[79/255 241/255 103/255],'visible','on');

cosine\_data=text(x(k)/2,y(k)+r\*.08,str\_cosine,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',11,...

'FontName','Futura Bk BT',...

'Color',[223/255 82/255 139/255],'visible','on');

length\_chord=text(((x(k)+r)/2)+r\*.01,(y(k)/2)-r\*.1,str\_chord1,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',11,...

'FontName','Futura Bk BT',...

'Color',[235/255 212/255 167/255],'visible','on');

sine\_data=text((x(k)+r\*.035),(y(k)/2)-r\*.01,str\_sine,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',11,...

'FontName','Futura Bk BT',...

'Color',[150/255 181/255 238/255],'visible','on');

cap\_xy = sprintf('(x,y) \\rightarrow (%.3f , %.3f)', x(k), y(k));

cap\_sine = sprintf('sin\\theta \\rightarrow %.3f',s(k));

cap\_cosine = sprintf('cos\\theta \\rightarrow %.3f',c(k));

cap\_tangent= sprintf('tan\\theta \\rightarrow %.3f',q(k));

if floor(r)~=r

cap\_inner=sprintf('radius \\rightarrow %.2f',r);

else

cap\_inner=sprintf('radius \\rightarrow %d',r);

end

cap\_arc=sprintf('\\theta in degree \\rightarrow %.3f%c \n in radian \\rightarrow %.3f\\pi',deg(k),char(176),rad(k));

cap\_arc\_tra=sprintf('arc \\rightarrow %.3f\\pi',rad(k)\*r);

cap\_arc\_sec=sprintf('arc sector area \\rightarrow %.3f\\pi',(.5\*(r^2)\*(deg(k)/180)));

data\_sin=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',13,...

'FontName','Futura Bk BT',...

'str',cap\_sine,...

'Position',[r\*2 r\*.95],...

'Color',[150/255 181/255 238/255]);

data\_cos=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',13,...

'FontName','Futura Bk BT',...

'str',cap\_cosine,...

'Position',[r\*2 r\*.85],...

'Color',[223/255 82/255 139/255]);

data\_tan=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',13,...

'FontName','Futura Bk BT',...

'str',cap\_tangent,...

'Position',[r\*2 r\*.75],...

'Color',[79/255 241/255 103/255]);

data\_arc=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',13,...

'FontName','Futura Bk BT',...

'str',cap\_arc,...

'Position',[r\*2 r\*.6],...

'Color',[227/255 140/255 128/255]);

data\_xy=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',13,...

'FontName','Futura Bk BT',...

'str',cap\_xy,...

'Position',[r\*2 r\*.4],...

'Color','yellow');

data\_inner=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',13,...

'FontName','Futura Bk BT',...

'str',cap\_inner,...

'Position',[r\*1.90+r\*.1 -r\*.5],...

'Color',[243/255 156/255 18/255]);

data\_chord=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',13,...

'FontName','Futura Bk BT',...

'str',str\_chord,...

'Position',[r\*1.90+r\*.1 -r\*.2],...

'Color',[235/255 212/255 167/255]);

data\_arc\_tra=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',13,...

'FontName','Futura Bk BT',...

'str',cap\_arc\_tra,...

'Position',[r\*1.90+r\*.1 -r\*.3],...

'Color',[221/255 206/255 90/255]);

data\_arc\_sec=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',13,...

'FontName','Futura Bk BT',...

'str',cap\_arc\_sec,...

'Position',[r\*1.90+r\*.1 -r\*.4],...

'Color',[255/255 195/255 0/255]);

data\_Title=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',20,...

'FontName','Futura Bk BT',...

'str','the circle',...

'Position',[-r r],...

'Color','white');

BC=sqrt(y(k)^2);

CD=sqrt((x(k)-p(k))^2);

AB=sqrt(x(k)^2);

OA=sqrt(y(k)^2);

BDC=atand(BC/CD);

str\_AB=sprintf('OC = AB = %.3f',sqrt(x(k)^2));

str\_BC=sprintf('OA = BC = %.3f',sqrt(y(k)^2));

str\_CD=sprintf('CD = %.3f',sqrt((x(k)-p(k))^2));

str\_BD=sprintf('BD = %.3f',sqrt((BC^2)+(CD^2)));

str\_BDC=sprintf('\\angleBDC = %.3f%c',BDC,char(176));

str\_CBD=sprintf('\\angleCBD = %.3f%c',90-atand(BC/CD),char(176));

str\_AOB=sprintf('\\angleAOB = \\angleOBC = %.3f%c',acosd(BC/r),char(176));

if x(k)>0 && y(k)>0 || x(k)<0 && y(k)>0 || x(k)<0 && y(k)<0

position\_1=[r -r\*.2];

else

position\_1=[r r\*.95];

end

data\_AB=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',13,...

'FontName','Futura Bk BT',...

'str',str\_AB,...

'Position',position\_1-[0 r\*.2],...

'Color',[223/255 82/255 139/255]);

data\_BC=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',13,...

'FontName','Futura Bk BT',...

'str',str\_BC,...

'Position',position\_1-[0 r\*.3],...

'Color',[150/255 181/255 238/255]);

data\_CD=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',13,...

'FontName','Futura Bk BT',...

'str',str\_CD,...

'Position',position\_1-[0 r\*.1],...

'Color',[94/255 240/255 224/255]);

data\_BD=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',13,...

'FontName','Futura Bk BT',...

'str',str\_BD,...

'Position',position\_1,...

'Color',[79/255 241/255 103/255]);

data\_BDC=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',12,...

'FontName','Futura Bk BT',...

'str',str\_BDC,...

'Position',position\_1-[0 r\*.5],...

'Color',[192/255 137/255 215/255]);

data\_CBD=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',12,...

'FontName','Futura Bk BT',...

'str',str\_CBD,...

'Position',position\_1-[0 r\*.6],...

'Color',[171/255 118/255 194/255]);

cap\_OBD=sprintf('\\angleOBD = \\angleOCB = \\angleABC = \\angleBCD = 90%c',char(176));

data\_OBD=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',12,...

'FontName','Futura Bk BT',...

'str',cap\_OBD,...

'Position',position\_1-[0 r\*.8],...

'Color',[132/255 90/255 150/255]);

data\_AOB=text('Parent',ax,...

'BackgroundColor',[0.149019607843137 0.149019607843137 0.149019607843137],...

'FontSize',12,...

'FontName','Futura Bk BT',...

'str',str\_AOB,...

'Position',position\_1-[0 r\*.7],...

'Color',[160/255 109/255 181/255]);

if k==length(t)

break;

end

pause(.1);

delete(cosine\_plot);

delete(sine\_plot);

delete(tangent\_plot);

delete(radius);

delete(cosine\_data);

delete(sine\_data);

delete(tangent\_data);

delete(angle\_data);

delete(data\_sin)

delete(data\_cos)

delete(data\_tan)

delete(data\_arc)

delete(data\_xy)

delete(length\_b)

delete(length\_c)

delete(length\_a)

delete(length\_0)

delete(length\_d)

delete(chord\_plot)

delete(data\_Title)

delete(data\_inner)

delete(length\_chord)

delete(data\_AB)

delete(data\_BC)

delete(data\_CD)

delete(data\_BD)

delete(data\_BDC)

delete(data\_CBD)

delete(data\_OBD)

delete(data\_arc\_tra)

delete(data\_arc\_sec)

delete(data\_AOB)

delete(data\_chord)

end