SCHOOL OF INDIANA

HOME OF VISIONARIES

MATHS

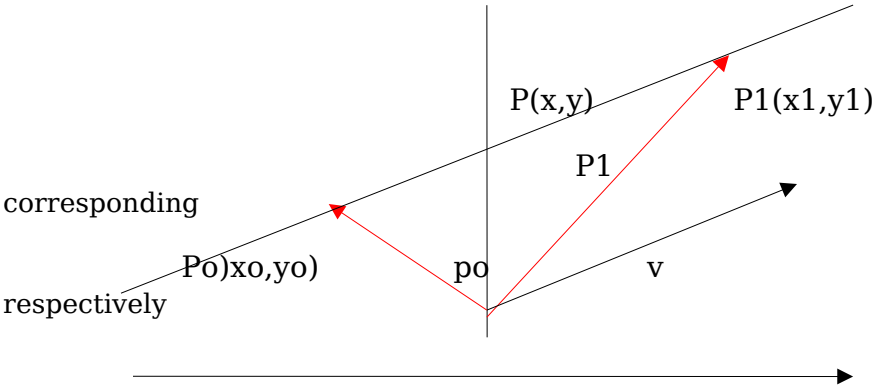
GRADE ELEVEN NATURAL NOTE ` Friday May 15, 2020

8.4 **Application of vector** (reading assignment in your text book from page 311-319)

Vectors ands lines

Vector equation of line l

Suppose that l is in a plane passing through a point po(xo,yo) parallel to a non vector v=(a,b). then p(x,y) is a set of all point on line l for which pop is paralal to v



P1-po =(x1-xo,y1-yo)

Where po and p1 are

Position vectors

Points po and p1

Let p(x,y) be any point on l , then the postion of vector of p is obtained from the relation p-po = pop=ƛ_p1-p2)

i.e p-po=ƛ (p-po), where ƛ is a scalar

if a direction vector v=(p1-po and a point po(xo,yo) are given , then the vector equation of the line determined by po and v is

p=po+ ƛ v, ƛ Є |R, V≠0

If v(a,b) , p(x,y) and po(xo,yo) , then the above equation can be written as : (x,y) =(xo,yo) + ƛ (a,b) or

X= xo+ ƛ a

Y= yo + ƛ b : ƛ Є |R,(a,b) ≠ (0,0)

This system of equation is called the parametric equation of the line l, through po(xo,yo), whose direction is that of the vector v=(a,b) , ƛ is called a parameter

Now if a and b are both different from zero (o), then

$\frac{x-xo}{a}$ = ƛ and $\frac{y-yo}{b}$= ƛ then ƛ $\frac{x-xo}{a}$ =$\frac{y-yo}{b}$, which is called standard equation of the line . the above can be written as

$\frac{1}{a}$x - $\frac{1}{a}$ xo = $\frac{1}{b}$y - $\frac{1}{b}$ yo= $\frac{1}{a}$x - = $\frac{1}{b}$y +($\frac{1}{b}$ yo-$\frac{1}{a}$ xo)=0

Ax + By + C + 0 where A = $\frac{1}{a}$, B =$\frac{-1}{b}$ and C= $\frac{1}{b}$ yo - $\frac{1}{a}$ xo

Example find the vector equation of the line through (1,3) and (-1,-1)

Solution po=(1,3) and p1 =(-1,-1)

Thus , the vector equation of the line is

(x,y) = (1,3) + ƛ(-1,-1)- (1,3)= (1,3)+ ƛ(-2,4)

(x,y) =(1,3) +(-2 ƛ, -4 ƛ)

(x,y) = (1-2 ƛ ,3-4 ƛ)

The parametric vector equation is

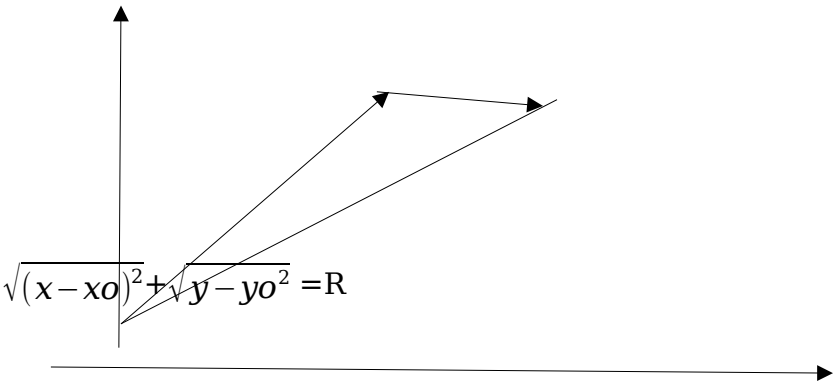
X= 1-2 ƛ y= 3-4 ƛ , ƛ ∈ |R, and

The standard equation is $\frac{x-1}{-2}$ + $\frac{y-3}{-4}$

Vectors and circles

Using vector method find the general equation of the circle with center c(xo,yo) and radius R.

Let p(x,y) be set of point in a circle such that |cp| + R



Cp=(x,y) – (xo-yo)

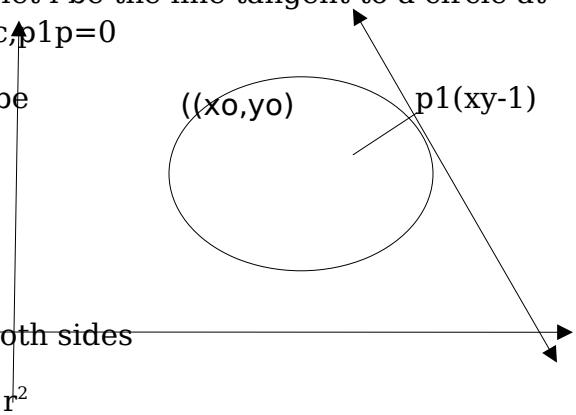
Cp= (x-xo,y-yo)

|cp| = $\sqrt{(x-xo)^2}+\sqrt{y-yo^2}$

$(x-x0)^2 + (y-y0)^2 = R^2$

Equation of tangent line to a circle

Let the circle is given by $(x-xo)^2 + (y-yo)^2 + r^2$, r.0 let l be the line tangent to a circle at p1(x1,y1) if. P(x,y) is any arbitrary point on l , p1c,p1p=0



Therefore , the equation of the tangent line must be

(x-x1,y-y1)- (x1 – xo, y1-yo)=0

(x-x1)(x1- xo)+ (y-y1)(y1-yo)=0
p(x,y)

$(x1-xo)^2 +(y1-y0)^2 =r^2$ ..... adding to both sides

$(x-x1)(x1-xo)+ y-y1)(y1-yo) +(x1-xo)^2+ (y1-yo)^2 = r^2$

$(x-xo)+(x1-xo) + (y-yo) = r^2$

NOTE. if the circle is centered at the origin , then the above equation becomes : x1.x + y.y1=r^2

EXAMPLE find the equation of the tangent line to the circle x2+ y2=8 at the point p1(2,-2)

Solution c(0,0) and r =$\sqrt{2}$

The equation of the tangent line is 2x – 2y =8

EXERCISE

Prove that the sum of the three vectors determined by the medians of a triangle directed from the vertices is zero (refer page 318)

NB :- exercises 8.5 (page3 319-320)

Solve equation number 3,5,6,8 and 10)