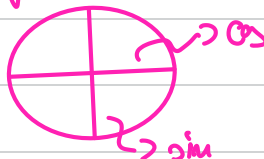


Warm-up - Seminar 4

u.1. Determine a cartesian equation for the line l in the following cases:

a) l contains $A(-2, 3)$, $\angle 60^\circ$ w/ OX

A line's direction vector is given by:

$$v(\cos x, \sin x) \rightarrow$$


We have the unit vector
 $u(\cos 60^\circ, \sin 60^\circ) = (\frac{1}{2}, \frac{\sqrt{3}}{2})$
in the opposite dir:

$$v(\frac{1}{2}, -\frac{\sqrt{3}}{2})$$

Writing the parametric equations $A(-2, 3)$:

$$\begin{cases} x = -2 + \frac{1}{2}t \\ y = 3 + \frac{\sqrt{3}}{2}t \end{cases} \quad \left| \quad \begin{cases} x = -2 + \frac{1}{2}t \\ y = 3 - \frac{\sqrt{3}}{2}t \end{cases} \right.$$

$$\left. \begin{aligned} t &= \frac{x+2}{\frac{1}{2}} = 2(x+2) \\ t &= \frac{y-3}{\frac{\sqrt{3}}{2}} = \frac{2(y-3)}{\sqrt{3}} \end{aligned} \right\} \Rightarrow l: \frac{x+2}{1} = \frac{(y-3)}{\sqrt{3}}$$

b) $B(1,7)$ and orthogonal to $n(4,3)$

If a line is perpendicular to a vector $n(A,B) \Rightarrow$

$$l: A(x-x_0) + B(y-y_0) = 0$$

$$\frac{B(1,7)}{n(4,3)} \Rightarrow l: 4(x-1) + 3(y-7) = 0$$

$$4x - 4 + 3y - 21 = 0$$

$$l: 4x + 3y - 25 = 0$$

4.2. Consider the line l

a) if $v(v_1, v_2)$ is a dir. vector for l , then
 $n(v_2, -v_1)$ is a normal vector

In dim 2 \forall vector orthogonal to a direction is a
normal vector $\hookrightarrow \perp$

$$\langle v, n \rangle = v_1 v_2 + v_2 (-v_1) = 0 \Rightarrow v \perp n \Rightarrow n\text{-normal}$$

$$J = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$$

$$J \begin{bmatrix} v_1 \\ v_2 \end{bmatrix} = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} v_1 \\ v_2 \end{bmatrix} = \begin{bmatrix} -v_2 \\ v_1 \end{bmatrix}$$

! Any vector \perp to a normal vector is a direction

! \bar{J} -operator is defined as follows:

$\forall v \in V \setminus \emptyset: \exists \bar{J}(v):$

a) $\bar{J}(v) \perp v$

b) $|\bar{J}(v)| = |v|$

c) $(v, \bar{J}(v))$ is right-oriented