

## Lesson 3

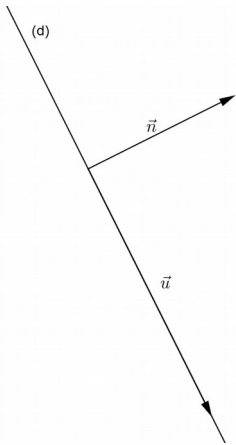
### Line equations

In a coordinate system, we have two sorts of line equations :

- general equation:**  $ax+by+c=0$  with  $a, b, c$  real numbers,  $a$  and  $b$  can be zero but not both at the same time. Every line has a general equation. One line has an infinity of general equations

$\vec{u} \begin{pmatrix} -b \\ a \end{pmatrix}$  is a **direction vector** of the line

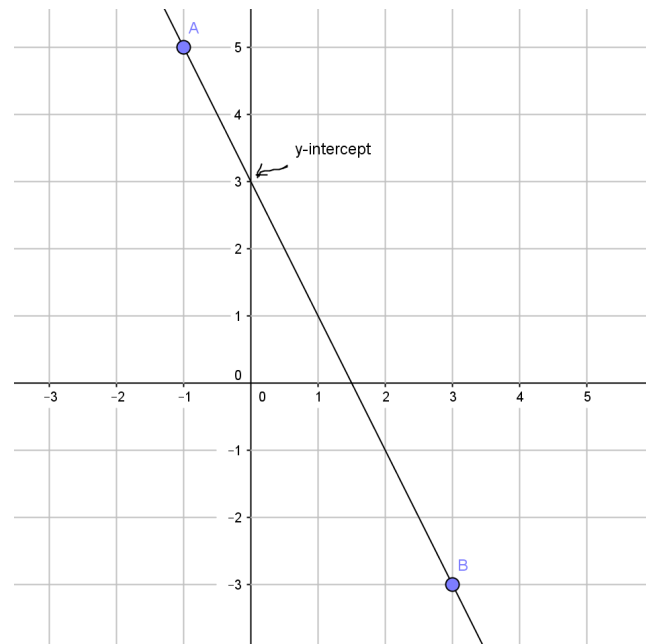
$\vec{n} \begin{pmatrix} a \\ b \end{pmatrix}$  is a **normal vector** of the line



- explicit equation:**  $y=mx+p$

$$m = \text{the slope} = \frac{y_B - y_A}{x_B - x_A}$$

$p = \text{the y-intercept}$



- a vertical line has as equation:  $x=a$
- a horizontal line has as equation:  $y=a$
- We use line equations to:
  - know if a point is on a line
  - prove that 2 lines are parallel or perpendicular
  - calculate the coordinates of the intersection point of two lines

#### Exercises:

1

A line (d) has as slope  $m=2$  and passes through  $A(3;1)$ :

- Find the explicit equation of (d)
- Can you give a direction vector of this line?

2

Compute the general equation of d with  $\vec{u} \begin{pmatrix} 1 \\ 3 \end{pmatrix}$  as direction vector passing through  $A(-2;4)$ .

Is the point  $B(5;5)$  on this line?

3

$A(6;3)$ ,  $B(-3;0)$ ,  $C(5;4)$ ,  $D(-1;1)$  are points in an orthonormal coordinate system

- Prove that (OA) and (BC) are parallel
- Compute the general equation of (BC)
- Are points B, C and D collinear?
- Find the value of  $y$  for which  $M(0;y)$  is on (BC).
- Find the value of  $x$  for which  $N(x;20)$  is on (BC)