This statement is a lie

$P(n,r) = \frac{n!}{(n-r)!}$ - ordered lists

$C(n,r) = \frac{n!}{(n-r)!\,r!}$ - ~~[illegible]~~ unordered lists / subsets

E.g.: How many 3-letter sequences can be made from the letters

f, u, a, c, k? $P(5,3)$

E.g.: How many ways are there to choose 4 marbles from a bag with 8 marbles?

$C(8,4)$

$A = \{\text{Dirk, Johan, Frans, Sarie}\}$

$B = \{\text{Frans, Sarie, Tina, Klaas, Henrika}\}$

$C = \{\text{Frans, Hans}\}$

$n(A \cap (B \cup C))$

$\cap$ - inter-section

$\cup$ - union

$B \cup C = \{\text{Frans, Sarie, Tina, Klaas, Henrika, Hans}\}$

$A \cap (B \cup C) = \{\text{Frans, Sarie}\}$

$n(A \cap (B \cup C)) = 2.$

$\cancel{n(B \cup C) = n(B) + n(C) - n(B \cap C)}$

A' - the complement of A in S

$S|A$ $\quad S = \{\cancel{1}, \cancel{2}, 3, 4\}$, $A = \{1, 2\}$

$S|A = \{3, 4\}$

S, $A \subseteq S$, $B \subseteq S$

$(A \cap B)' = S \setminus (A \cap B)$

$S = \{1, 2, 3, 4, 5\}$

$A = \{1, 2, 3\}$

$B = \{3, 4\}$

$A \cap B = \{3\}$

$S \setminus (A \cap B) = S \setminus \{3\} = \{1, 2, 4, 5\}$.

~~3.1~~ Ch 3 : Systems of Linear Equations & Matrices

Def^n: A linear equation in two unknowns is an equation of the form

$$ax + by = c$$

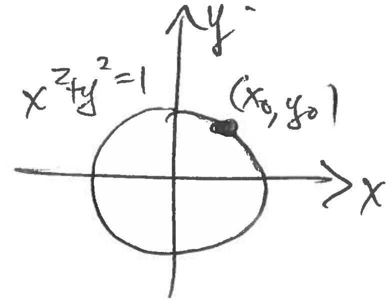
$a, b \in \mathbb{R}$, not both zero.

Def^n: The graph of an equation in two variables is the set of all pairs of real numbers, (x, y)

that satisfy the equation.

$$\{(x,y)\in\mathbb{R}^2 \mid x,y \text{ make the equation valid}\}$$

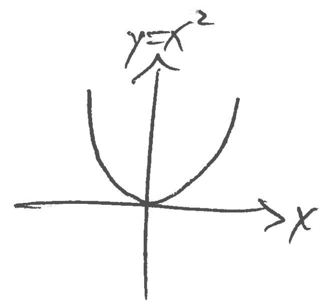
E.g.: $y^2+x^2=1$



$$\{(x,y)\in\mathbb{R}^2 \mid x^2+y^2=1\}$$

This is the unit circle. $x_0^2+y_0^2=1$.

E.g.: $y=x^2$



$$\{(x,y)\in\mathbb{R}^2 \mid y=x^2\}$$
$$\|$$
$$\{(x,x^2)\in\mathbb{R}^2\}.$$

Cartesian plane.

$$\mathbb{R}^2=\mathbb{R}\times\mathbb{R}$$
$$=\{(x,y) \mid x\in\mathbb{R}, y\in\mathbb{R}\}$$

E.g.: Linear equations

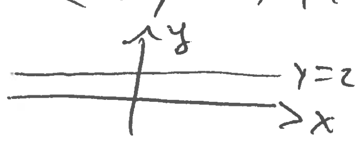
$\mathbb{R}$ - the real numbers

$$ax+by=c$$

$a=0$, $b\neq 0 \Rightarrow y=c/b$ (horizontal line)

$$\{(x,c/b) \mid x\in\mathbb{R}\}$$

E.g. $c/b=2$,

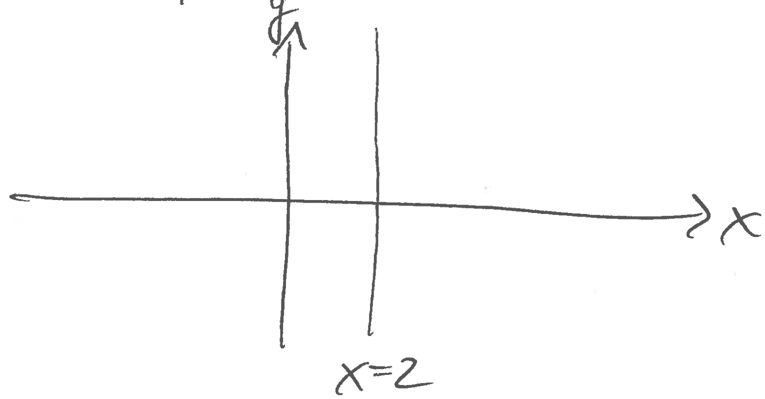


$b=0,\ a\neq 0$

$$ax = c \Rightarrow x = c/a \quad \text{(vertical line)}$$

~~e.g.~~ $\{(c/a, y) \mid y \in \mathbb{R}\}$

e.g. $c/a = 2,\ b=0$



when $a\neq 0,\ b\neq 0,$

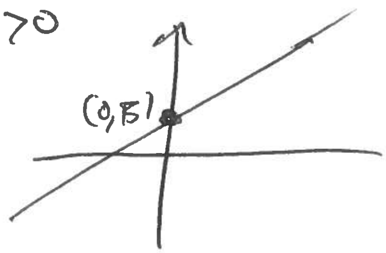
$$ax+by = c \Rightarrow by = -ax+c$$
$$\Rightarrow y = -\left(\frac{a}{b}\right)x + \frac{c}{b}$$

Let $m = -\frac{a}{b}$, $B = c/b$,

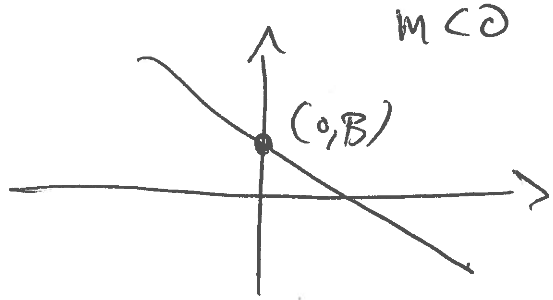
$$y = mx + B$$

$$\{(x, mx+B) \mid x \in \mathbb{R}\}$$

$m>0$



$m<0$



Def^n: A system of two linear equations in 2 unknowns is a pair of linear equations

$$a_1 x + b_1 y = c_1$$
$$a_2 x + b_2 y = c_2.$$

A solution to a system is a pair of real numbers, (x_0, y_0) such that

$$a_1 x_0 + b_1 y_0 = c_1$$
and
$$a_2 x_0 + b_2 y_0 = c_2$$

This is to say that (x_0, y_0) is an element of both sets

$\{(x,y) \mid a_1 x + b_1 y = c_1\}$ ← graph of first linear equation

and

$\{(x,y) \mid a_2 x + b_2 y = c_2\}$ ← graph of the second linear equation.

that is, (x_0, y_0) lies on the intersection of these 2 lines.