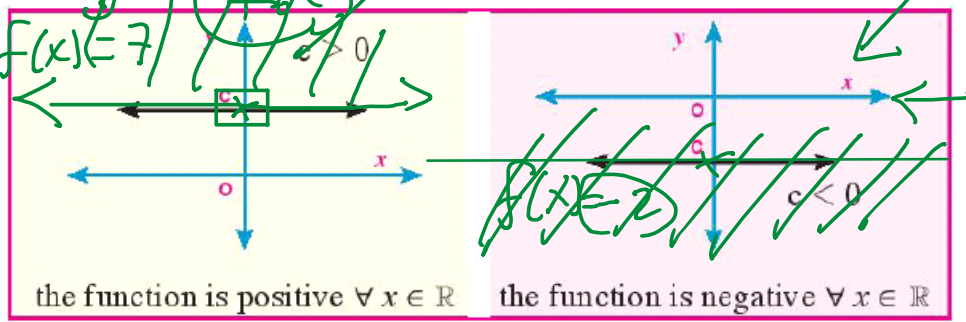


①

First: Sign of the Constant Function

Sign of the constant function f where $f(x) = c$ ($c \neq 0$) is the same as the sign of $c \forall x \in \mathbb{R}$. and the following figure shows the sign of the function f .



$b^2 - 4ac$
 $\rightarrow = 0$ one real root
 $\rightarrow > 0$ two real def.
 $\rightarrow < 0$ two com...

(+) (-)

$f(x) = +7$

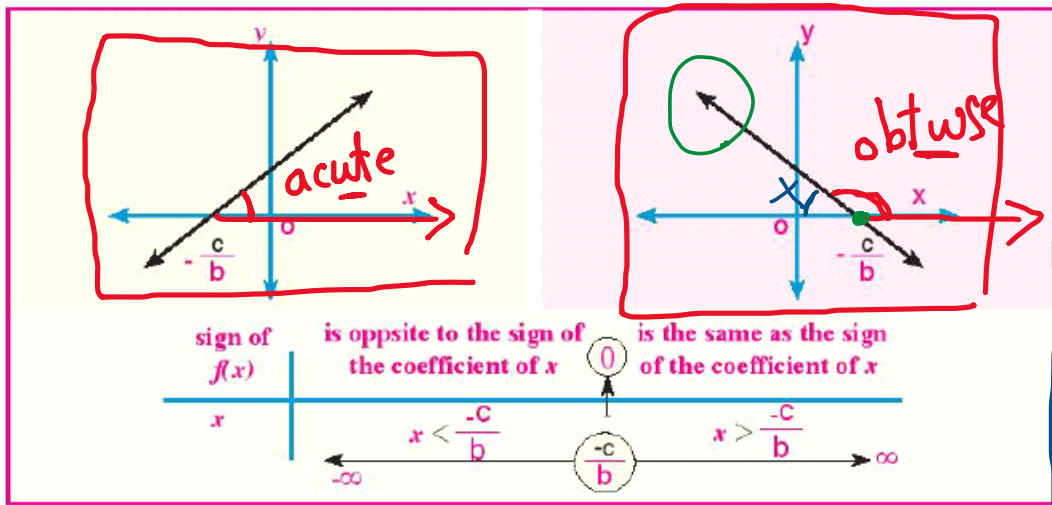
(+ve)

$f(x) = -2$

(-ve)

Second: Sign of the Linear Function

the rule of the function f is $f(x) = bx + c$, $b \neq 0$, $x = -\frac{c}{b}$ when $f(x) = 0$ and the following figure shows the sign of the function f .

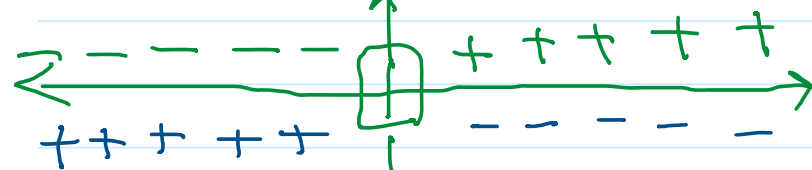


$f(x) = bx + c$

① point of intersection with x-axis.

$x = \frac{-c}{b}$

$b = +$

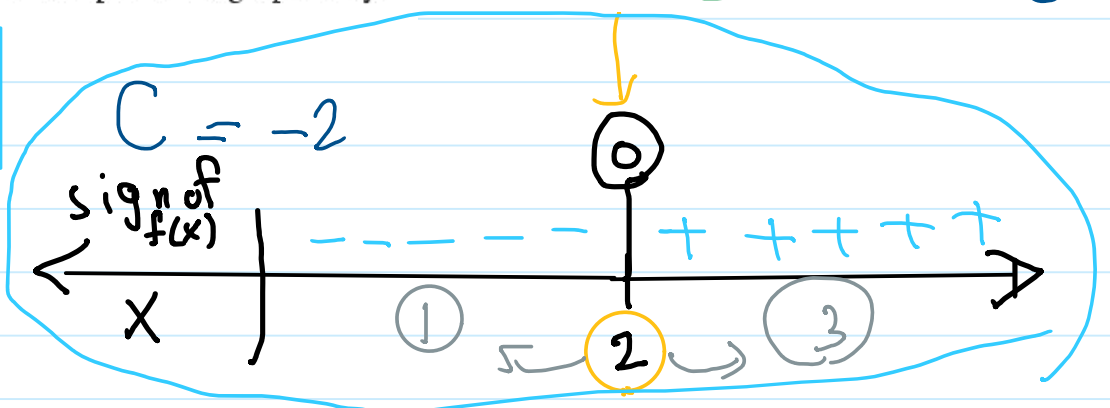


$b = -$

② Determine the sign of the function f where $f(x) = x - 2$ and represent it graphically:

$f(x) = x - 2 \rightarrow b = 1$

$x = \frac{-c}{b} = \frac{2}{1} = 2$



fun. is (+ve) : $x > 2$

fun. is (-ve) : $x < 2$

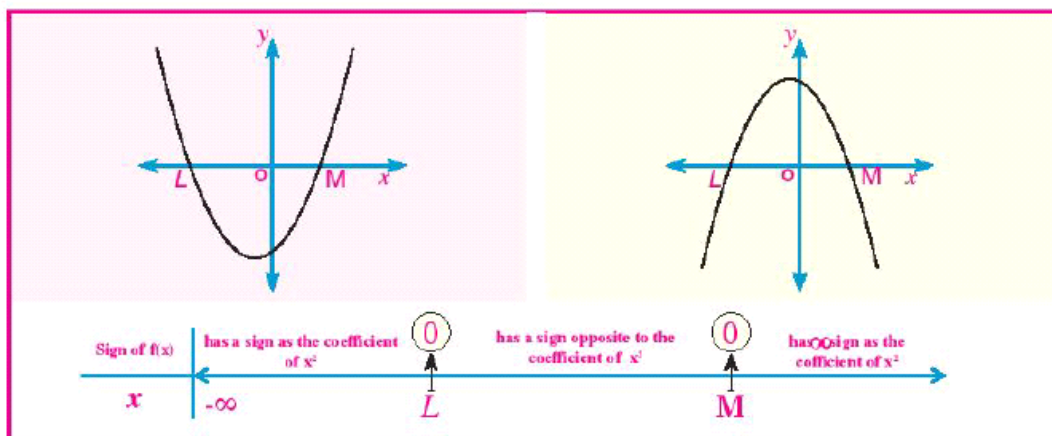
$$x = \frac{-b}{a}$$

Third: Sign of the Quadratic Function.

To determine the sign of the quadratic function f , where $f(x) = ax^2 + bx + c$

We find the discriminant of the equation $ax^2 + bx + c = 0$ if:

First $b^2 - 4ac > 0$ then there are two real roots L and M of the equation, and let $L < M$, then the sign of the function is as in the following figure:



3 Represent graphically f , where $f(x) = x^2 - 2x - 3$, then determine the sign of the function f .

Screen clipping taken: 10/9/2025 9:55 AM

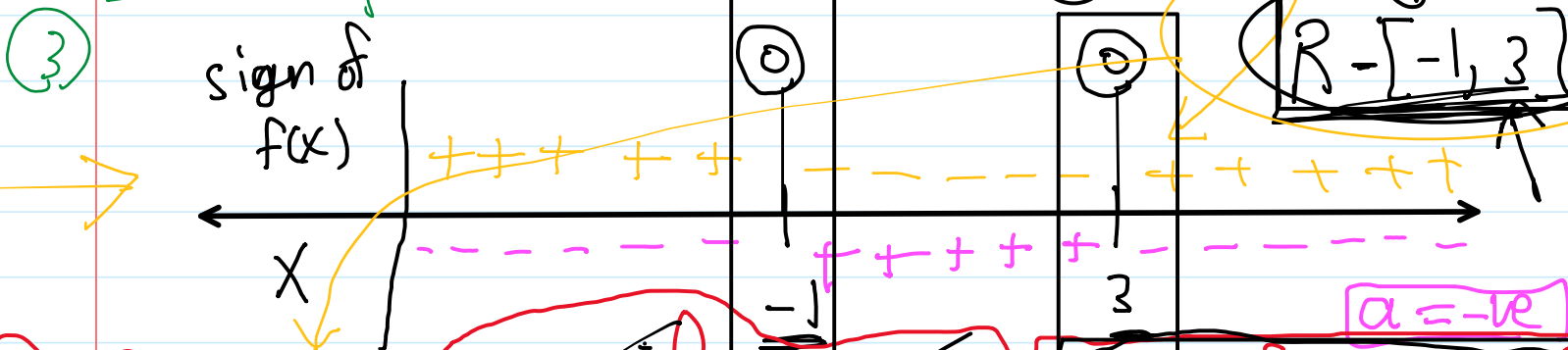
$b^2 - 4ac$

- $= 0$ → ✓
- > 0 → ✓
- < 0 → ✓

$a = 1, b = -2, c = -3$

1 $(-2)^2 - 4 \times 1 \times -3 = 4 + 12 = 16 > 0$ two real diff.

2 $x^2 - 2x - 3 = 0$
 $(x - 3)(x + 1) = 0$
 $x = 3, x = -1$



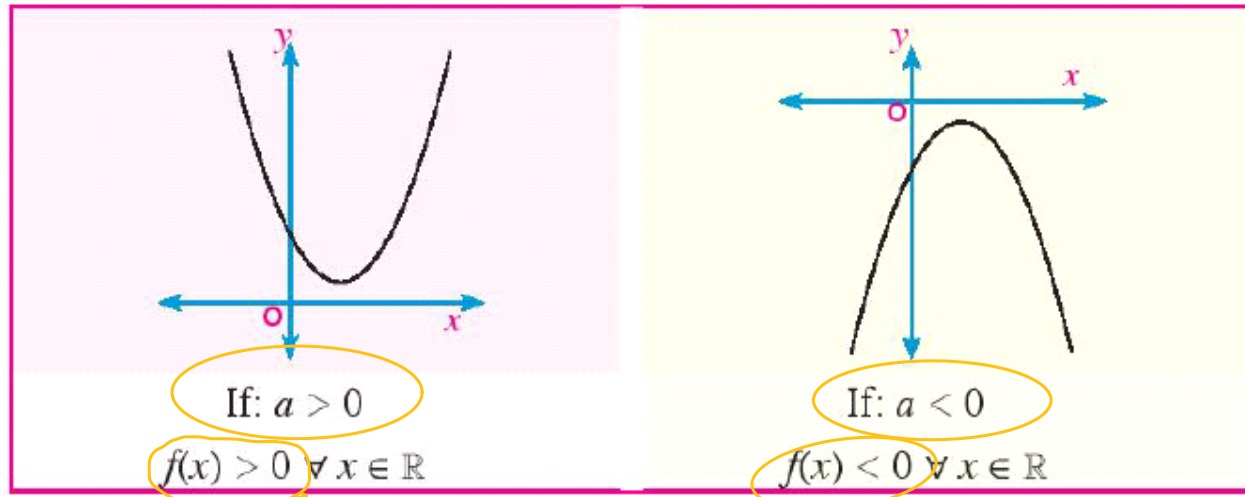
4 f^n is (+ve): $x < -1$ & $x > 3$ → $]-\infty, -1[\cup]3, \infty[$

f^n is (-ve): $-1 < x < 3$ → $]-1, 3[$

complex root

$3 - 3i$
 $2 + i$

Second: If: $b^2 - 4ac < 0$, then there are no real roots and the sign of the function f is the same as the sign of the coefficient of x^2 , and the following figures show that.



④ Represent graphically f where $f(x) = x^2 - 4x + 5$, then determine the sign of the function f .

$f(x) = x^2 - 4x + 5$

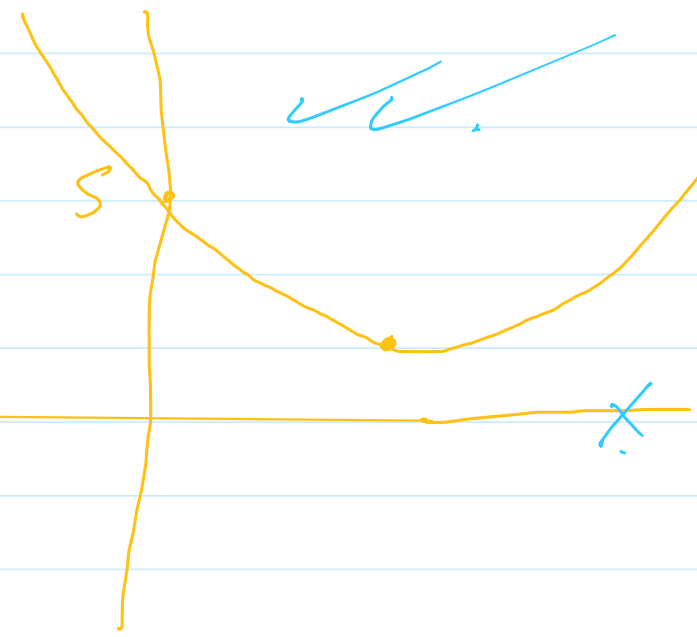
x	-2	-1	0	1	2	3	4	5	6	7
y		10	5	2	1	2	5	10		

① $b^2 - 4ac = (-4)^2 - 4 \times 1 \times 5$

$= 16 - 20 = -4 < 0$

$a = 1$
 $b = -4$
 $c = 5$

② two comp. diff



③ $a = 1 > 0$

$\therefore f'' > 0 \rightarrow (+ve)$