

1. september  
2021

3.5-3.6 Kvalifikasjon  
Rasjonale ulikhetar

Reflektar - r og -s

$$(x+r)(x+s) = x^2 + (r+s)x + rs.$$

Eksempel

$$x^2 + 7x + 10 = (x+5)(x+2)$$

$7=5+2$       $\underbrace{5 \cdot 2}$

①

$$x^2 + 3x - 10 = (x+5)(x-2)$$

$5-2$       $5(-2)$

$$x^2 - 3x - 10 = (x-5)(x+2)$$

$2-5$       $2(-5)$

$$4x^2 + 12x + 8 = 4(x^2 + 3x + 2)$$
$$= \underline{4(x+2)(x+1)}$$

oppgave  
Faktoriser

$$x^2 + 7x + 12$$

( 3+4    3-4 )

$$= (x+4)(x+3)$$

$$x^2 - x - 20$$

4.5

-1 = 4-5

$$= (x+4)(x-5)$$

②

$$x^2 - x > 20 \Leftrightarrow x^2 - x - 20 > 0$$

" spørsmål om fortegn "

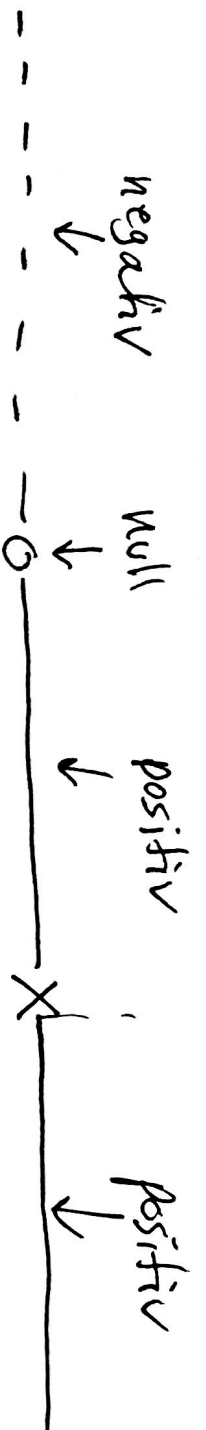
$$\Leftrightarrow (x+4)(x-5) > 0$$

Løsningene er alle  $x$  hvor  
både  $(x+4)$  og  $(x-5)$  er enten  
positive eller begge er negative.

|              |             |             |  |
|--------------|-------------|-------------|--|
|              | -4          | 5           |  |
| $x+4$        | - - - - - 0 | - - - - -   |  |
| $x-5$        | - - - - -   | - - - - - 0 |  |
| $(x+4)(x-5)$ | - - - - - 0 | - - - - - 0 |  |

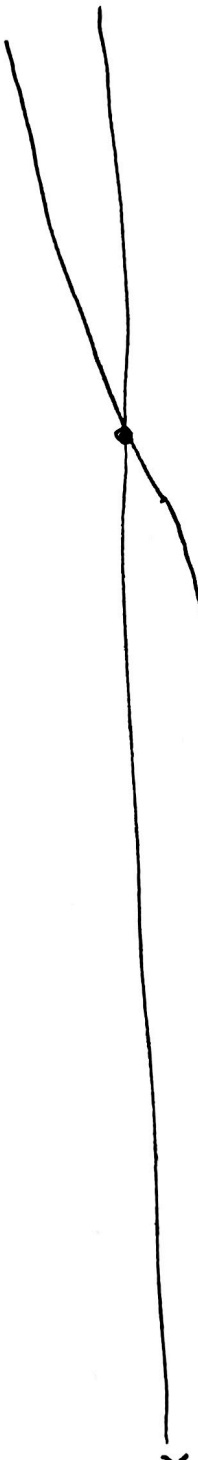
Løsningene er

$x \in (-\infty, -4) \cup (5, \infty)$



ist die Definition

③



opposite  
 $x^2 - 5x + 6 < 0$

$x^2 - 5x + 6 = (x-2)(x-3)$

$x-2$       2      3  
 ----- 0 -----  
 $x-3$       ----- 0 -----  
 $(x-2)(x-3)$       ----- 0 -----

$6 = 2 \cdot 3 = (-2)(-3)$   
 $2+3 = 5$   
 $-2-3 = -5$

Lösungen er  $x \in \langle 2, 3 \rangle$ .



appears.

$$x^2 - 4x + 4 > 0$$

$$(x-2)(x-2) > 0$$



Lösungene  $x \in \mathbb{R} \setminus \{2\}$

alternativ  $x \in \langle -\infty, 2 \rangle \cup \langle 2, \infty \rangle$

④

$$x^3 - 16x < 0$$

$$x(x^2 - 16) = x(x-4)(x+4) < 0$$

-4      0      4

Lösungene

$x \in \langle -\infty, -4 \rangle \cup \langle 0, 4 \rangle$



$\cup$  union

$\cap$  Schnitt

$$x^2 + x > 1$$

$$x^2 + x - 1 > 0$$

$$(x - x_1)(x - x_2) > 0$$

5

$x_1$   $x_2$

$$x - x_1 \quad \text{---} \quad \text{---} \quad \text{---} \quad 0 \quad \text{---} \quad \text{---} \quad \text{---}$$

$$x - x_2 \quad \text{---} \quad \text{---} \quad \text{---} \quad \text{---} \quad 0 \quad \text{---} \quad \text{---} \quad \text{---}$$

$$(x - x_1)(x - x_2) \quad \text{---} \quad \text{---} \quad \text{---} \quad 0 \quad \text{---} \quad \text{---} \quad \text{---} \quad 0 \quad \text{---} \quad \text{---} \quad \text{---}$$

Lösungsgang  $x \in (-\infty,$

$$\frac{-1 - \sqrt{5}}{2} > \cup < \frac{\sqrt{5} - 1}{2}, \infty >$$

$$a=1 \quad b=1 \quad c=-1$$

$$x^2 + x - 1 = 0$$

2. Gradesformel:

$$x = \frac{-1 \pm \sqrt{1^2 - 4 \cdot 1 \cdot (-1)}}{2 \cdot 1}$$

$$x = \frac{-1 \pm \sqrt{5}}{2}$$

$$x_1 = \frac{-1 - \sqrt{5}}{2} \approx -1.618$$

$$x_2 = \frac{-1 + \sqrt{5}}{2} \approx 0.618.$$

### 3.6 Rationale Umlinien

$$\frac{x+1}{x-2} > 0$$

$$x \neq 2$$

⑥

$$(x+1) \cdot \frac{1}{x-2} > 0$$

$$\begin{array}{c} -1 \\ 2 \end{array}$$

$$\begin{array}{c} (x+1) \\ 1/(x-2) \end{array}$$

$$\frac{x+1}{x-2}$$

Lösungsgang

$$x \in (-\infty, -1) \cup (2, \infty)$$

$$\frac{x+1}{x-2} \geq -1$$

$$\frac{x+1}{x-2} + 1 \geq 0 \Leftrightarrow \frac{x+1}{x-2} + \frac{x-2}{x-2} \geq 0$$

$$\frac{1}{x-2} (x+1 + (x-2)) = \frac{2x-1}{x-2} \geq 0$$

$$(2x-1) \cdot \frac{1}{x-2} \geq 0$$

$$2x-1 \quad \text{---} \quad -0 \quad \frac{1}{2} \quad \text{---} \quad 2$$

$$1/(x-2) \quad \text{---} \quad \text{---} \quad \text{---} \quad -x \quad \text{---}$$

$$\frac{2x-1}{x-2} \quad \text{---} \quad 0 \quad \text{---} \quad \text{---} \quad -x \quad \text{---}$$

$$\text{Lösungsmenge ist } x \in (-\infty, \frac{1}{2}] \cup (2, \infty)$$

$$\frac{x-3}{x+5} \leq 0$$

-5                      3

oppg.

$$\begin{array}{c} x-3 \\ \hline 1/(x+5) \end{array}$$

⑧

$$(x-3)/(x+5)$$

Løsningene er  $x \in (-5, 3]$

oppg.

$$\frac{x^2-5x+4}{x^2-x-2} \geq 0$$

$$\begin{aligned} & \frac{x^2-5x+4}{x^2-x-2} = (x-4)(x-1) \\ & x^2-x-2 = (x-2)(x+1) \end{aligned}$$

$$\frac{(x-4)(x-1)}{(x-2)(x+1)} \geq 0$$



-1 1 2 4

$$x-4$$

$$x-1$$

$$1/(x-2)$$

$$1/(x+1)$$

$$\frac{x^2-5x+4}{x^2-x-2}$$

$$\frac{x^2-5x+4}{x^2-x-2} = \frac{(x-4)(x-1)}{(x-2)(x+1)}$$

Lösungsgang  $x \in (-\infty, -1) \cup [1, 2) \cup [4, \infty)$

Ans

$$\frac{x+3}{x-2} > x-5$$

$\Leftrightarrow$

$$\frac{(x-5)(x-2)}{x-2} - \frac{x+3}{x-2} < 0$$

$$\frac{x^2-7x+10-(x+3)}{x-2} < 0$$

$$\frac{x^2-8x+7}{x-2} < 0$$

$$\frac{(x-7)(x-1)}{x-2} < 0$$

10

$$\begin{array}{ccccccc} & & & 1 & 2 & & 7 \\ & & & - & - & - & - \\ x-7 & & & & & & 0 \end{array}$$

$$\begin{array}{ccccccc} & & & - & - & - & - \\ x-1 & & & & 0 & & \end{array}$$

$$\begin{array}{ccccccc} & & & - & - & - & - \\ 1/(x-2) & & & & x & & \end{array}$$

$$\begin{array}{ccccccc} & & & - & - & - & - \\ x^2-8x+7 & & & & 0 & - & x & - & - & - & 0 \end{array}$$

$$\text{Lösungsgemein für } \underline{x \in (-\infty, 1) \cup (2, 7)}$$

$$\begin{array}{ccccccc} & & & - & - & - & - \\ & & & & 1 & & 2 \\ & & & - & - & - & - \\ & & & & 0 & & \end{array}$$

$$\begin{array}{ccccccc} & & & - & - & - & - \\ x-1 & & & & & & 0 \end{array}$$

$$\begin{array}{ccccccc} & & & - & - & - & - \\ 2-x & & & & & & 0 \end{array}$$

$$\begin{array}{ccccccc} & & & - & - & - & - \\ (x-1)^4 & & & & 0 & & \end{array}$$