Find the domain of the function

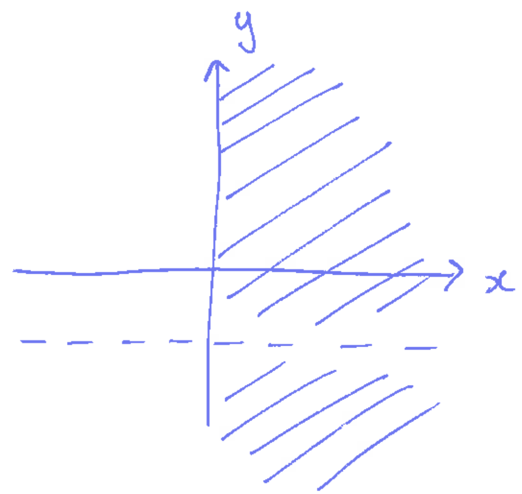
$$g(x,y) = \frac{\sqrt{x}}{1+y}.$$

For $\sqrt{x}$ to be defined, we require $x \geq 0$.

For $\frac{1}{1+y}$ to be defined, we require $1+y \neq 0$ i.e. $y \neq -1$.

$$\text{domain} = \{(x,y) \in \mathbb{R}^2 \mid x \geq 0 \text{ and } y \neq -1\}.$$

dotted line means it is not in the domain



Example: Find the domain of the function

$$F(x,y,z,w) = \left(\frac{x+z}{y^2+1}, \frac{z}{\ln(x+y)}\right).$$

$F : D(F) \longrightarrow \mathbb{R}^2$, $D(F) \subseteq \mathbb{R}^4$

For $\frac{1}{y^2+1}$ to be defined, we require $y^2+1 \neq 0$ — this is always true because $y^2+1 \geq 1$.

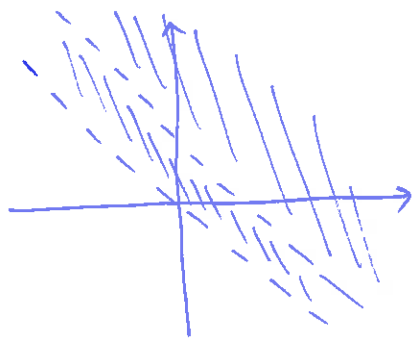
For $\frac{1}{\ln(x+y)}$ to be defined, we require $\ln(x+y) \neq 0$

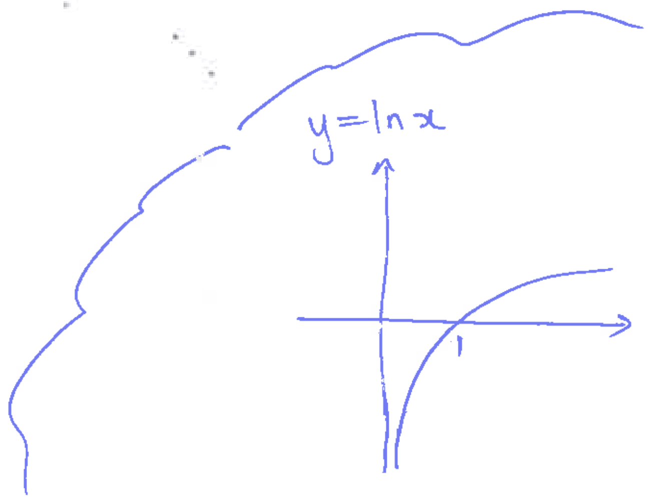
$x+y \neq 1$ $y \neq 1-x$.

For $\ln(x+y)$ to be defined, we require $x+y>0$

$y>-x$

domain is $\{(x,y)\in\mathbb{R}^2 \mid y>-x \text{ and } y\neq 1-x\}$





Example: Describe the graph of $k(x,y) = x - y$.

The graph is: $z = x - y$

$$0 = x - y - z$$

This is a plane through the origin with normal $\vec{i} - \vec{j} - \vec{k}$.