Facts to Know:

Function Properties: Consider a function \( f : X \rightarrow Y \).

- **Injective/One-to-one** -

- **Surjective/Onto** -

- **Bijective** -

Examples:

1. (a) Determine whether the exponential map \( f : \mathbb{R} \rightarrow \mathbb{R}, f(x) = e^x \) is injective and/or surjective.

(b) What changes if we consider this as a function \( f : \mathbb{R} \rightarrow \mathbb{R}^+ \) where \( \mathbb{R}^+ = \{ r \in \mathbb{R} : r > 0 \} \)?
2. Is the map $g : \mathbb{R}^2 \to \mathbb{R}$ where $g(x,y) = x^2 - y^2$ injective? Is it surjective?

3. Let $S$ be the set $\{(x,y) \in \mathbb{R}^2 : x \neq y\}$. Show the map $h : S \to \mathbb{R}^2$ defined by $h(x,y) = (x - y, x^2 - y^2)$ is injective but not surjective.