1. Given the following functions $f$ and $g \circ f$, what could $g$ be? \[25 \text{ pts}\]

$$f = \{(1, 3), (2, 4), (3, 4), (4, 1)\}$$
$$g \circ f = \{(1, 3), (2, 1), (3, 1), (4, 7)\}$$

2. Define $f(x) = x$ for $x \in \mathbb{R}$ and $g(x) = |x|$ for $x \in \mathbb{R}$. Prove that: \[25 \text{ pts}\]

$$\forall A \subseteq \mathbb{R}, f\bigg|_A = g\bigg|_A \iff A \subseteq [0, \infty)$$

3. Suppose that $f : A \to B$. Prove that $f \circ I_A = f$. \[25 \text{ pts}\]

4. Prove that the function $f(x) = \frac{x}{1-x}$ for $x > 1$ is increasing. \[25 \text{ pts}\]