Some useful set theoretic identities.

Suppose r is a relation. Then $\mathbf{dmn}\, r^{-1} = \mathbf{rng}\, r$ and $\mathbf{rng}\, r^{-1} = \mathbf{dmn}\, r$.

Suppose f is a function. Then f is univalent if and only if f^{-1} is a function.

Suppose r and s are relations. Then

$$\mathbf{dmn}\, s \circ r = r^{-1}[\mathbf{dmn}\, s] \quad \text{and} \quad \mathbf{rng}\, s \circ r = s[\mathbf{dmn}\, r].$$

Suppose r and s are relations and A is a set. Then

$$r \circ s[A] = r[s[A]].$$

Suppose f and g are functions. Then

$$f(x) \in \mathbf{dmn}\, g \text{ and } g \circ f(x) = g(f(x)) \quad \text{whenever } x \in \mathbf{dmn}\, g \circ f.$$

Suppose f is a function and A is a set and $x \in \mathbf{dmn}\, f$. Then

$$f(x) \in f[A] \;\Leftrightarrow\; x \in A.$$

Let X be a set. Then

$$\{(x, x) : x \in X\}$$

is a univalent function whose domain and range is X and whose inverse is itself; we call this function the **identity function of** X.