Relations

3.1.3: Find the domain and range of the relation W on $\mathbb{R}$ given by $x\,W\,y$ if

(a) $y = 2x + 1$

(b) $y = x^2 + 3$

(c) $y = \sqrt{x-1}$

(d) $y = \frac{1}{x^2}$

3.1.6: Find the inverse of each relation. Express the inverse as the set of all pairs (x, y) subject to some condition.

(a) $R_1 = \{(x, y) \in \mathbb{R} \times \mathbb{R} : y = x\}$

(b) $R_2 = \{(x, y) \in \mathbb{R} \times \mathbb{R} : y = -5x + 2\}$

(f) $R_6 = \{(x, y) \in \mathbb{R} \times \mathbb{R} : y < x + 1\}$

(g) $R_7 = \{(x, y) \in \mathbb{R} \times \mathbb{R} : y > 3x - 4\}$

(h) $R_8 = \left\{(x, y) \in \mathbb{R} \times \mathbb{R} : y = \frac{2x}{x-2}\right\}$

3.1.11: Let R be a relation from A to B and S be a relation from B to C.

(a) Prove that $\text{Rng}(R^{-1}) = \text{Dom}(R)$.

(b) Prove that $\text{Dom}(S \circ R) \subseteq \text{Dom}(R)$.