Given a binary relation R from A to B and sets $X \subseteq A$ and $Y \subseteq B$, we define:

(a) $R[X] = \{y \in B \mid (\exists x \in X)(x, y) \in R\}$

(b) $\mathrm{rng}(R) = R[A] = \{y \in B \mid (\exists x \in A)(x, y) \in R\}$

(c) $R^{-1}[Y] = \{x \in A \mid (\exists y \in Y)(x, y) \in R\}$

(d) $\mathrm{dom}(R) = R^{-1}[B] = \{x \in A \mid (\exists y \in B)(x, y) \in R\}$.