

1. (3) 为函数. Def: (1) $\forall x \in \text{dom}(f)$, 存在唯一 $y \in \text{ran}(f)$, st xfy .
 (1)(2) 不符合单值性. (2) $\text{dom}(f) = A$.

2. (1) 是; $\text{dom}(f) = \{1, 2, 3\}$; $\text{ran}(f) = \{\langle 2, 3 \rangle, \langle 3, 2 \rangle, \langle 4, 1 \rangle\}$
 (2) 不是
 (3) 是. $\text{dom}(f) = \{1, 2, 3\}$; $\text{ran}(f) = \{\langle 2, 3 \rangle\}$

3. 均不一定是.
 反例: $A = \{0, 1, 2\}$; $B = \{0, 1, 2\}$
 $f = \{\langle 0, 1 \rangle, \langle 1, 2 \rangle, \langle 2, 0 \rangle\}$ $g = \{\langle 0, 1 \rangle, \langle 2, 1 \rangle, \langle 1, 0 \rangle\}$
 则 $f \cap g = \{\langle 0, 1 \rangle\}$ 不为函数 (符合单值性不符, 不符合 A 上全域性)
 $f \cup g = \{\langle 0, 1 \rangle, \langle 1, 2 \rangle, \langle 2, 0 \rangle, \langle 2, 1 \rangle, \langle 1, 0 \rangle\}$
 不为函数

4. $f(0) = 0$ $f(\{0\}) = \{0\}$, $f[\{0, 2, 4, 6, \dots\}] = \{0, 1, 2, 3, \dots\}$
 $f[\{1, 3, 5, \dots\}] = \{1\}$, $f^{-1}[\{2\}] = \{4\}$, $f^{-1}[\{3, 4\}] = \{6, 8\}$

6.

	满射	单射	双射
(1)	✓	✗	✗
(2)	✗	✓	✗
(3)	✗	✗	✗
(4)	✗	✗	✗

定义域为 $N - \{0\}$, 故不满射

7. A 为恒等关系时:

g 为双射, 则 A 与 A/R 的元素个数相同

若 A 为非恒等的等价关系, 则 A/R 的元素个数必小于 A 的元素个数

另一方面, A 为恒等关系时, g 必为双射.

故充要条件为 A 为恒等关系

9. (1) $n \geq m$ (2) $m \geq n$; (3) $m = n$

10. ① $f = \{\langle 1, a \rangle, \langle 2, b \rangle, \langle 3, c \rangle\}$

② $f: A \rightarrow B$; $f = 2x + 1$.

③ $A = \{\{a, b, c\}, \{a, b\}, \{b, c\}, \{c, a\}, \{a\}, \{b\}, \{c\}, \emptyset\}$

$B = XY = \{f_1, f_2, f_3, f_4, f_5, f_6, f_7, f_8\}$

$f_1 = \{\langle a, 0 \rangle, \langle b, 0 \rangle, \langle c, 0 \rangle\}$

$f_2 = \{\langle a, 0 \rangle, \langle b, 0 \rangle, \langle c, 1 \rangle\}$

$f_3 = \{\langle a, 0 \rangle, \langle b, 1 \rangle, \langle c, 0 \rangle\}$ $f_4 = \{\langle a, 0 \rangle, \langle b, 1 \rangle, \langle c, 1 \rangle\}$ $f_5 = \{\langle a, 1 \rangle, \langle b, 0 \rangle, \langle c, 0 \rangle\}$

$f_6 = \{\langle a, 1 \rangle, \langle b, 0 \rangle, \langle c, 1 \rangle\}$ $f_7 = \{\langle a, 1 \rangle, \langle b, 1 \rangle, \langle c, 0 \rangle\}$ $f_8 = \{\langle a, 1 \rangle, \langle b, 1 \rangle, \langle c, 1 \rangle\}$

构造 $g: P(X) \rightarrow XY$

$\{\langle \{a, b, c\}, f_1 \rangle, \langle \{a, b\}, f_2 \rangle, \langle \{a, c\}, f_3 \rangle,$

$\langle \{b, c\}, f_4 \rangle, \langle \{a\}, f_5 \rangle, \langle \{b\}, f_6 \rangle,$

$\langle \{c\}, f_7 \rangle, \langle \emptyset, f_8 \rangle\}$