



习题 11

1. (1) 不是
- (2) 不是
- (3) 是

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. 解: $f \cap g$ 是 $f \cup g$ 的子集

$$1^\circ A = \{1, 2, 3\} \quad B = \{3, 4\}$$

$$f(1) = 3, \quad f(2) = 3$$

$$g(1) = 3, \quad g(2) = 4$$

$$\text{则 } f \cap g = \{ \langle 1, 3 \rangle \}$$

$$\therefore \exists x = 2, \text{ s.t. } \forall y \in B, \langle x, y \rangle \notin f \cap g$$

$$2^\circ A = \{1, 2, 3\} \quad B = \{3, 4\}$$

$$f(1) = 3, \quad f(2) = 4$$

$$g(1) = 4, \quad g(2) = 3$$

$$\text{则 } \exists y = 3, \text{ s.t. } \langle 1, 3 \rangle \in f \cup g$$

$$\text{且 } \langle 2, 3 \rangle \in f \cup g$$

4. 解

$$f(0) = 0$$

$$f[\{0\}] = \{0\}$$

$$f[\{0, 2, 4, 6, \dots\}] = \{0, 1, 2, 3, \dots\}$$

$$f[\{1, 3, 5, \dots\}] = \{1\}$$

$$f[\{2\}] = \{4\}$$

$$f[\{3, 4\}] = \{6, 8\}$$

6. (1) 均不是

(2) 是单射, 不是满射或双射

(3) 均不是

(4) 均不是

7. 1° g 是单射.

$$\text{则 } \forall x_1 \neq x_2 \in A, [x_1]_R \neq [x_2]_R$$

$$\text{则 } \forall x_1 \neq x_2 \in A, x_1 R x_2$$

$$\text{则 } R = I_A$$

只需验证 2° g 是满射

$$R = I_A \text{ 时 } A/R = \{ \{x\} \mid x \in A \}$$

$$\text{则 } \forall y \in A/R, \exists x \in y, \text{ s.t. } g(x) = y$$

故 g 是满射

$$\text{综上 } R = I_A$$

8. 解: (1) $m \leq n$

$$(2) \quad m \geq n$$

$$(3) \quad m = n$$

$$\text{证: (2) } f: A \rightarrow B$$

$$f(x) = 2x + 1$$

$$q \in X_Y$$

$$(3) \quad f: A \rightarrow B$$

$$f(x) = \{ \langle p, q \rangle \mid$$

$p \in P(x), \forall a \in x$
若 $a \in p$ 则 $q(a) = 1$, 否则 $q(a) = 0$

