

1.3 The Language of Relations and Functions

p. 21 #1, 2, 4, 6, 8, 12-17, 19-20

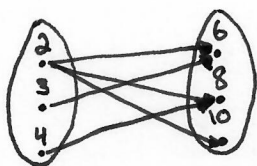
① a) No ; Yes ; No ; Yes

b) $R = \{(2, 6), (2, 8), (2, 10), (3, 6), (4, 8)\}$

c) Domain: $\{2, 3, 4\}$;

Co-Domain: $\{6, 8, 10\}$

d)

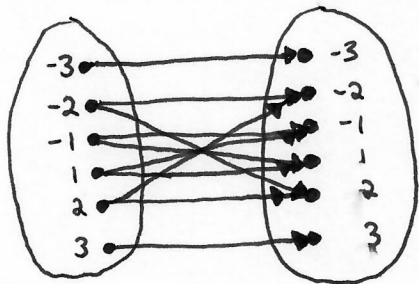


② a) Yes ; Yes ; Yes ; No

b) $R = \{(-3, -3), (-2, -2), (-2, 2), (-1, -1), (-1, 1), (1, -1), (1, 1), (2, -2), (2, 2), (3, 3)\}$

c) Domain = Co-Domain = $\{-3, -2, -1, 1, 2, 3\}$

d)



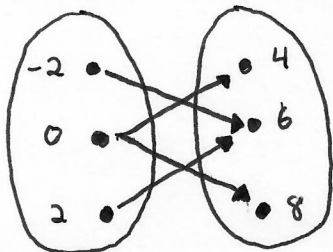
④ a) Yes ; No ; No ; No

b) $R = \{(-2, 6), (0, 4), (0, 8), (2, 6)\}$

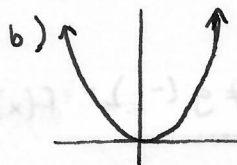
c) Domain: $\{-2, 0, 2\}$;

Co-Domain: $\{4, 6, 8\}$

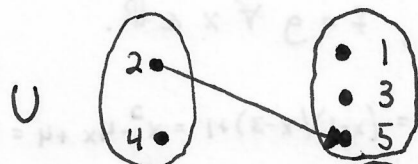
d)



⑥ a) Yes ; No ; Yes ; No



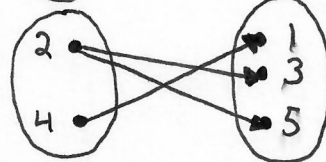
⑧ a)



V



W



b) None of these are functions.

⑫ No. $(1, \sqrt{2}) \in T$ and $(1, -\sqrt{2}) \in T$.

$$\sqrt{2} \neq -\sqrt{2}$$

⑬ a) Domain: $\{-1, 0, 1\}$;

Co-Domain: $\{t, u, v, w\}$

b) $F(-1) = u$;

$F(0) = w$;

$F(1) = u$;

⑭ a) Domain: $\{1, 2, 3, 4\}$;

Co-Domain: $\{a, b, c, d\}$

b) $G(1) = c$;

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15 Only d.

16 $f(-1) = 1$;
 $f(0) = 0$;
 $f(1/2) = 1/4$;

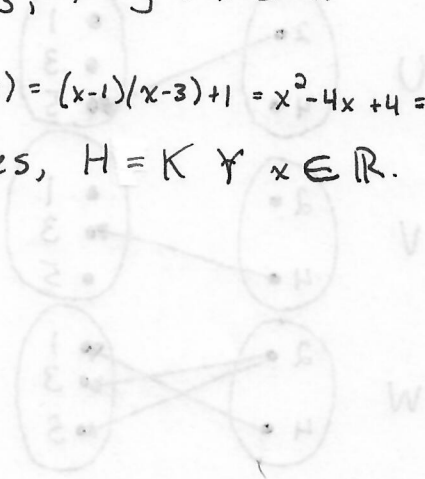
17 $g(-1000) = -999$;
 $g(0) = 1$;
 $g(999) = 1000$

19 $g(x) = \frac{2x^3 + 2x}{x^2 + 1} = \frac{2x(x^2 + 1)}{(x^2 + 1)} = 2x = f(x)$

Yes, $f = g \forall x \in \mathbb{R}$.

20 $K(x) = (x-1)(x-3)+1 = x^2 - 4x + 4 = (x-2)^2$

Yes, $H = K \forall x \in \mathbb{R}$.



d) None of these are functions.

12 No. $(1/2) \in T$ and $(1, 1/2) \in T$.

13 a) Domain: $\{-1, 0, 1\}$;
 Co-Domain: $\{1, 2, 3, 4, 5\}$

b) $f(-1) = 2$;
 $f(0) = 3$;
 $f(1) = 4$

14 a) Domain: $\{1, 2, 3, 4\}$;
 Co-Domain: $\{1, 2, 3, 4\}$

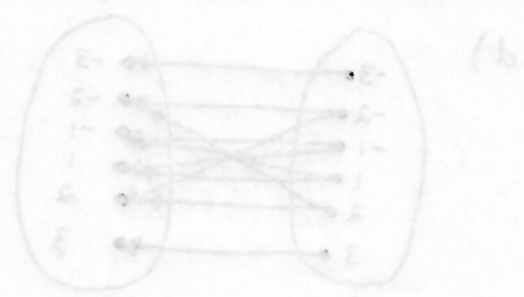
b) $f(1) = 2$;
 $f(2) = 3$;
 $f(3) = 4$;
 $f(4) = 1$

9. 21, 22, 23, 24, 25, 26, 27, 28, 29, 30

1 a) No, No, No, No
 b) $R = \{(1,1), (1,2), (2,1), (2,2)\}$
 c) Domain: $\{1, 2, 3, 4\}$
 Co-Domain: $\{1, 2, 3, 4\}$



2 a) Yes, Yes, No
 b) $R = \{(1,1), (1,2), (2,1), (2,2), (3,1), (3,2), (3,3), (3,4)\}$
 c) Domain = Co-Domain = $\{1, 2, 3, 4\}$



3 a) Yes, No, No
 b) $R = \{(1,1), (1,2), (2,1), (2,2)\}$
 c) Domain: $\{1, 2, 3\}$;
 Co-Domain: $\{1, 2, 3\}$

