San Jose State University
Department of Mathematics, College of Science
Fall 2009
MATH 42, Discrete Mathematics
Answers of HW4

Please ask if you do not understand the answers.
Please report if you find any errors, typos.

2.1 # 1

a) $\{-1, 1\}$
b) $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11\}$
c) $\{0, 1, 4, 9, 16, 25, 36, 49, 64, 81\}$
d) $\{\ \}$ empty set

2.1 # 5

a) YES
b) NO
c) YES
d) NO
e) NO
f) NO

2.1 # 8

a) T
b) T
c) F
d) T
e) T
f) T
g) F because they are equal

2.1 # 21

a) $2^3 = 8$
b) $2^4 = 16$
c) $2^{2^0} = 2$

2.1 # 28

a) $\{(a, x, 0), (a, x, 1), (a, y, 0), (a, y, 1), (b, x, 0), (b, x, 1), (b, y, 0), (b, y, 1), (c, x, 0), (c, x, 1), (c, y, 0), (c, y, 1)\}$
b) $\{(0, x, a), (0, x, b), (0, x, c), (0, y, a), (0, y, b), (0, y, c), (1, x, a), (1, x, b), (1, x, c), (1, y, a), (1, y, b), (1, y, c)\}$
c) $\{(0, a, x), (0, a, y), (0, b, x), (0, b, y), (0, c, x), (0, c, y), (1, a, x), (1, a, y), (1, b, x), (1, b, y), (1, c, x), (1, c, y)\}$

d) $\{(x,x,x),(x,x,y),(x,y,x),(x,y,y),(y,x,x),(y,x,y),(y,y,x),(y,y,y)\}$

2.2 # 2

a) $A \cap B$

b) $A - B$

c) $A \cup B$

d) $\overline{A} \cup \overline{B}$

2.2 # 3

a) $\{0,1,2,3,4,5,6\}$

b) $\{3\}$

c) $\{1,2,4,5\}$

d) $\{0,6\}$

2.2 # 14 $A = \{1,3,5,6,7,8,9\}$ and $B = \{2,3,6,9,10\}$

2.2 # 25

a) $\{4,6\}$

b) $\{0,1,2,3,4,5,6,7,8,9,10\}$

c) $\{4,5,6,8,10\}$

d) $\{0,2,4,5,6,7,8,9,10\}$

2.2 # 30

a) NO

b) NO

c) YES

2.3 # 3

a) NO

b) YES

c) NO

2.3 # 4

a) domain = $\mathbf{N}$
range = {0 1, 2, 3, 4, 5, 6, 7, 8, 9 }

b) domain =$\mathbf{Z}^+$
range = $\{x : x \in \mathbf{Z}, x > 1\}$

c) domain = the set of all bit strings
range = $\mathbf{N}$

d) domain = the set of all bit strings
range = $\mathbf{N}$

2.3 # 12

a) YES

b) NO

c) YES

d) NO

2.3 # 15

a) YES

b) NO

c) YES

d) NO

e) YES

2.3 # 30 YES

Proof: Consider x_1, x_2 from the domain of g such that $g(x_1) = g(x_2)$. Then $f(g(x_1)) = f(g(x_2))$, and so $(f \circ g)(x_1) = (f \circ g)(x_2)$. It follows that $x_1 = x_2$ since $f \circ g$ is one-to-one. Consequently, g is one-to-one.