

# Homework 5

## Section 2.3

2.a)  $f(n) = \pm n$ , not a function

2.b)  $f(n) = \sqrt{n^2+1}$ , always output even number

2.c) not a function

6.c) Domain: set of all bit strings

range: all integers

8.e)  $\lceil 2.99 \rceil = 3$

8.f)  $\lceil -2.99 \rceil = -2$

12.a)  $f(n) = n-1$ ,  $\checkmark$  yes

12.c)  $f(n) = n^3$ ,  $\checkmark$  yes

12.b)  $f(n) = n^2-1$ ,  $\times$  no

12.d)  $f(n) = \lceil n/2 \rceil$ ,  $\times$  no

14.b)  $f(m,n) = m^2 - n^2$ , not onto!

14.c)  $f(m,n) = m+n+1$ , onto!

14.e)  $f(m,n) = m^2 - 4$ , not onto!

20.a)  $f(n) = n^2$  20.b)  $f(n) = \lceil n/2 \rceil$

20.c)  $f(n) = \begin{cases} n-1, & n \text{ is even} \\ n+1, & n \text{ is odd} \end{cases}$  20.d)  $f(n) = 5$

22.a) Yes

22.b) No because  $f(-x) = f(x)$

38.  $f \circ g(x) = (x+2)^2 + 1$

$g \circ f(x) = x^2 + 3$

71.  $f^{-1}(y) = (y-1)^{1/3}$

## Section 2.4

2.a)  $a_8 = 2^{8-1} = 128$

2.b) 7

2.c) 2

2.d) -256

6.b)  $a_n = \frac{n(n+1)}{2}$   $a_1 = 1$   $a_2 = 3$   $a_3 = 6$   $a_4 = 10$   $a_5 = 15$

$a_6 = 21$   $a_7 = 28$   $a_8 = 36$   $a_9 = 45$   $a_{10} = 55$

$a = \{1, 3, 6, 10, 15, 21, 28, 36, 45, 55\}$

10.c)  $a_1 = 3$   $a_2 = 27$   $a_3 = 2187$   $a_4 = 14348907$

$a_5 = 617673396283947 = \{1, 3, 27, 2187, 14348907, 617673396283947\}$

10.e)  $= \{1, 1, 2, 2, 1, 1\}$

$$\begin{aligned}
 12d) \quad a_n &= -3(2(-1)^{n-1} + 3) + 4(2(-1)^{n-2} + 3) \\
 &= -6(-1)^{n-1} - 9 + 8(-1)^{n-2} + 12 \\
 &= -6(-1)^{n-1} + 8(-1)^{n-2} + 3 \\
 2(-1)^n + 3 &= -6(-1)^{n-1} + 8(-1)^{n-2} \\
 &= (-4)^{n-2} \cdot (-6(-1)^2 + 8) \\
 &= (-4)^{n-2} \cdot -88 \quad \text{cancel} \checkmark
 \end{aligned}$$

$$14a) \quad a_n = a_{n-1}, \quad a_0 = 3$$

$$14.b) \quad a_n = a_{n-1} + 2, \quad a_0 = 0$$

$$14.d) \quad a_n = a_{n-1} \cdot 5, \quad a_0 = 1$$

$$14.f) \quad a_n = a_{n-1} + 2n, \quad a_0 = 0$$

$$14.h) \quad a_n = n \cdot a_{n-1}, \quad a_0 = 1$$

$$14.c) \quad a_n = a_{n-1} + 2, \quad a_0 = 3$$

$$14.e) \quad a_n = a_{n-1} + 2n - 1, \quad a_0 = 0$$

$$14.g) \quad a_n = a_{n-1} + 1 + 2(-1)^n, \quad a_0 = 1$$

$$16.d) \quad -4 \cdot 2^n + 3$$

$$16.f) \quad a_1 = 2(1)(3) = 6$$

$$a_3 = 2(3)(24) = 144$$

$$a_2 = 2(2)(6) = 24$$

$$a_n = 3 \cdot 2^n \cdot n!$$

$$18a) \quad a_n = 1.09 \cdot a_{n-1}, \quad a_0 = 1000$$

$$18.b) \quad a_n = 1000 \cdot 1.09^n, \quad a_0 = 1000$$

$$18.c) \quad \$5,529,041$$

$$26.b) \quad a_n = a_{n-1} + 4, \quad a_0 = 3$$

$$\dots 47, 51, 55$$

$$26.h) \quad a_n = 2^{2^n}$$

$$\dots 2^{64}, 2^{128}, 2^{256}$$