Homework

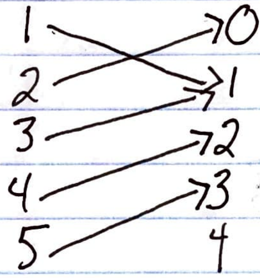
5.1

1.) a.) $\{a, b, c, d, e\}$

b.) $\{w, x, y, z\}$

c.) $\{w, y, z\}$

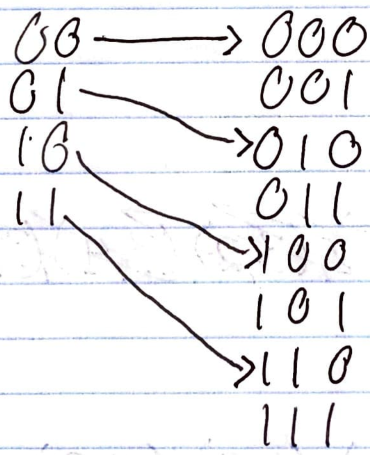
2.) a.)



$X = \{1, 2, 3, 4, 5\}$
$Y = \{0, 1, 2, 3, 4\}$

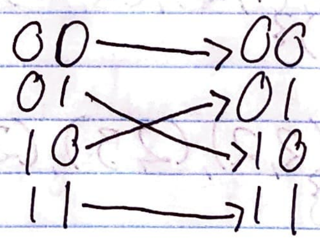
$f(x) = \{(1,1), (2,0), (3,1), (4,2), (5,3)\}$

b.)



$f(x) = \{(00, 000), (01, 010), (10, 100), (11, 110)\}$

c.)



$f(x) = \{(00, 00), (01, 10), (10, 01), (11, 11)\}$

Homework

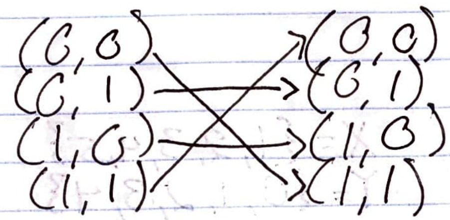
5.1

4.) a) $B \times B = (00, 11)$

Domain:

((1-0),(1-0)),((1-1),(1-0)),((1-0),(1-1)),((1-1),(1-1))

b.)



c.) {((1,1),(0,1),(1,0),(0,0)}

5.) a) (3,5,7,9)

b.) (4,9,16,25)

e.) (001,011,111)

~~d.) {(2,3),(2,4),(2,5),(3,2),(3,4),(3,5)}~~

f.) (5,6,7,8,9)

h.) {(1,1),(2,1),(3,1),(1,2),(2,2),(3,2),
(1,3),(2,3),(3,3)}

i.) {(1,2),(1,3),(1,4),(2,2),(2,3),(2,4),
(3,2),(3,3),(3,4)}

Homework

5.2 + 5.3

3.) a.) -4

b.) -4

c.) 5

4.) a.) Assume n is even $= 2k$ for integer k

then $\left\lfloor \frac{2k}{2} \right\rfloor = k$ and $\frac{2k}{2} = k$

True

b.) Assume n is odd $= 2k+1$

then $\left\lfloor \frac{2k+1-1}{2} \right\rfloor = k$ and $\frac{2k+1-1}{2} = k$

True

5.3

1.) yes, for every x, y there is an integer

$x = 3 \quad y = 1$ then $6 - 4 = 2$

b.) No, can give $(-1,-1)$ and $(1,1)$ and get the same answer.

c.) yes, always get an integer.

$x = 7, y = 12$

$7 + 12 - 2 = 17$

Homework

5.3

2) a.) Neither $x=2$ or $x=-2$
both $=4$
and can't get $y=5$
with x^2

b.) yes one-to-one but not onto

can't get $y=5$ with x^3

c.) yes one-to-one but not onto

Since $y \neq 5$ when x^3

e.) yes one-to-one but not onto
$y \neq 2$ $x=1$ then $f(x)=1$
$x=2$ then $f(x)=6$

f.) Both

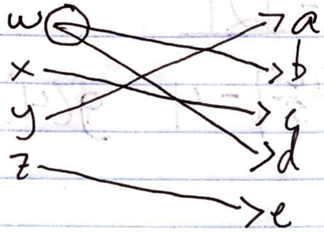
g.) one-to-one but not onto
Since $2y \neq 3$

j.) Both.

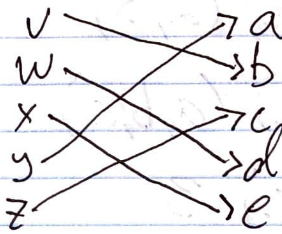
Homework.

5.4

1.) a.) f^{-1} is not well defined.



b.) f^{-1} is well defined



c.) is not well defined since $y = \emptyset$

2.) a.) $x = y - 3$ well-defined

b.) $x = \dfrac{y-34}{2}$ not well defined

c.) $x = \dfrac{y-3}{2}$ well defined

d.) Not well defined

g.) f^{-1} is well defined since you re-reverse the bits for instance

$f^{-1}(110) = 011$

Homework

5.5 + 5.7

2.) a.) $g(0) = 1$ $f(1) = \underline{1}$

b.) $\lceil \frac{52}{5} \rceil = 11$ $f(11) = \underline{121}$

c.) $f(4) = 16$ $h(16) = \lceil \frac{16}{5} \rceil = 4$ $g(4) = \underline{16}$

e.) $(2^x)^2$

5.) a.) $(2,3)$

b.) (a,b,c)

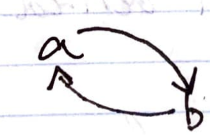
c.) 3

f.) g is neither one-to-one or onto

g.) g is not a bijection but h is a bijection

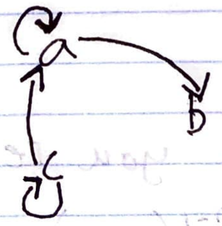
5.7

1.) a.)



$(a,b),(b,a),(c,c)$

b.)

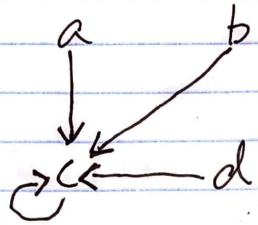


$(a,a),(a,b),(c,a),(c,c)$

Homework

5.7

f.)



(a,c),(b,c),(c,c),(d,c)

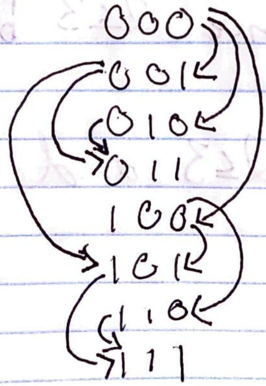
2.) a) $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ (1,1),(1,2),(1,3)

b.) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{bmatrix}$ (1,1),(1,3),(2,2),(2,3)

c.) $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & 1 & 0 \end{bmatrix}$ (1,2),(2,1),(3,1),(3,2)

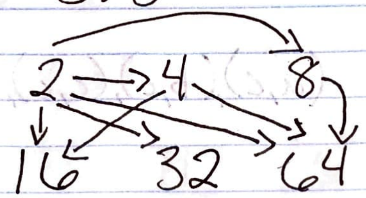
f.) $\begin{bmatrix} 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$ (1,1),(1,4),(2,1),(3,3),
(3,2),(4,3)

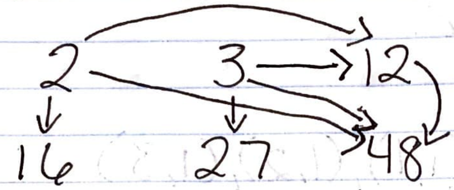
4.) a.)

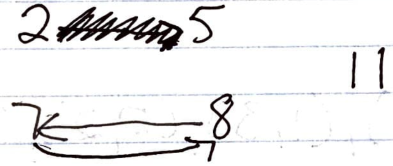


Homework

5.7 + 5.8

b.) 

c.) 

d.) 

5.8

1.) a.) Not reflexive since $1<1$ is false

~~Not~~ anti-Symmetric since $1<2$ is always ~~false~~ True but $2<1$ is always false.

Is transitive since $1<2$ and $2<3$ so $1<3$

b.) Is reflexive since $2\leq 2$ and $\mathbb{R}\leq\mathbb{R}$

Anti-symmetric since since $2\leq 3$ but $3\leq 2$ is false

Is transive since $1\leq 2$, $2\leq 3$ and $1\leq 3$

Homework

5.8

c.) Is reflexive since and number raised to the power of 1 equalls itself.

Is Symmetric if $x=y$ since $2^1=2$ and $2^1=2$

~~Not~~ transitive $2^2=4$ & $4^2=16$ also $2^4=16$

d.) Reflexive if $n=1$ then $y=xn$

Symmetric if $n=1$ then $y=xn$ and $x=yn$

Transitive since $4=2(2)$ & $8=4(2)$ also $8=2(4)$

e.) ~~Not reflexive since~~
~~Neither since $5-3=2 \leq 2$ true~~
~~but $3-5=-2$~~

Neither since $5-2=3\leq 2$ is false
but $2-5=-3\leq 2$ is true

~~Not Sy~~ Neither since $5-2\leq 2$ is false
but $2-5\leq 2$ is true

Not transitive $11-9\leq 2$ true
$9-7\leq 2$ true
$11-7\leq 2$ False

Homework

5.8

f.) Not reflexive since rational can be divisible by 1.

Not Symmetric since the sum of two rational numbers is rational

Not transitive

3.) a.) No, it can not be $x=y$ and $x \neq y$

b.) If its Symmetric there is no case $a=b$ and $b=a$. If anti-symmetric, there is such case. Thus no, its not possible.

c.) yes (A,A), (A,B), (B,A), (B,C), (C,A)

5.) a.) Anti-reflexive
Symmetric
Not transitive

b.) Anti-reflexive since $\cap$ then $A \neq B$
Neither
Transitive

c.) Neither
Neither
Not transitive.

Homework

5.9

1.) a.) 2

b.) 3

c.) c

d.) g

e.) (b,c,d), (c,f,e) (c,g,f,e)

f.) No ~~(c,d)~~ (f,c) doesn't exist. Which means no trail or path

g.) yes open walk. No edge More than once so trail
yes a path since all vertices are once

h.) yes it is circuit since it is closed walk with edges once.
yes a cycle since all appear only once.

2.) a.) yes a circuit but not a cycle since c appears more than once.

b.) (b,c,g,f,d)

c.) (c,g,f,e)

d.) (a,g,f,e,c)

e.) No

f.) yes (a,b,c)

More Problems.

g.) ~~[illegible]~~ (c,g,c,f)

j.) yes, you can get to each point if you start at A.