Homework 4

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1a) Not reflexive $(1+1 \neq 0)$
Symmetric $(x+y=0 \Rightarrow y+x=0)$
not antisymmetric
not transitive

b) Reflexive ✓
symmetric ✓
Antisymmetric X
Transitive ✓

c) Reflexive ✓ $x \geq 0$
Symmetric ✓ $xy \geq 0$, $yx \geq 0$
Anti Symmetric X It's symmetric
Not transitive X because $(-1)(0) \geq 0$, $0(1) \geq 0$, $(-1)(1) \geq 0$

d) Reflexive X
symmetric X
Antisymmetric ✓
Transitive ✓

e) Reflexive X
Symmetric ✓
Anti Symmetric X
Transitive X

2. a) $\frac{99 \cdot 100}{2} = 4950$

b) 99

a) 1

3. $\begin{bmatrix} 1 & 0 & 0 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

5. Reflexive - ✓ any string agrees with itself everywhere
Symmetric - ✓ if a agrees with b on any character after 4 then b also agrees with b.
Transitive - ✓ if a agrees with b and b agrees with c on some character then a agrees with c on this character. Thus the property holds

6. a) $\{(a,b),(a,c),(b,c),(c,b)\}$
b) $\{(a,a),(a,c),(b,b),(b,c),(c,c)\}$
c) $\{(a,a),(a,b),(a,c),(b,b),(b,c),(b,a),(c,c),(c,a),(c,b),(d,d)\}$

7. a) Reflexive ✓ always equal itself
Symmetric ✓ $f(0)=g(0)$ then $g(0)=f(0)$
Transitive ✓ if $f(0)=g(0)$, $g(0)=h(0)$, then $h(0)=f(0)$

b) Reflexive ✓ same as above
Symmetric ✓ same as above
Transitive X the value for $h(1)\neq f(0)$.

c) Reflexive X $f(x)-f(x)=0$
Symmetric X $f(x)-g(x)=1$, means $g(x)-f(x)=-1$
Transitive X $f(x)-g(x)=1$, $g(x)-h(x)=1$, $f(x)-h(x)=2$

e) Reflexive X $f(0)$ may not equal $f(1)$
Symmetric ✓ the property itself shows symmetry
Transitive X it may not necessarily work.

8. a) Yes

b) No - not antisymmetric (2,3) is missing

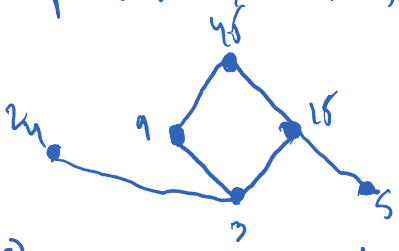
c) yes

d) yes

e) no - not antisymmetric because (0,2) and (2,0) is there
- not transitive missing (2,1) for (2,6), (6,1)

9. $\{0,2,5,10,11,15\}$ for less than or equal to

10. poset $(\{3,5,9,15,24,45\}, |)$



a) 24, 45 are maximal

b) 3, 5 are minimal

c) No greatest element. d) No least element

e) 15, 45 are upper bounds of $\{3,5\}$

f) 15 is the least upper bound of $\{3,5\}$

g) 3, 5, 15 are lower bounds of $\{15,45\}$

h) 15 is the greatest bound of $\{15,45\}$