CS 370 Concurrency worksheet

1) Apply the appropriate locks and show the resulting schedule for the following sequence of operations using strict 2PL. Assume locks can be upgraded.

   T1:R(X); T2:W(Y); T3:R(X); T2:R(X); T2:R(Z); T2:Commit; T3:W(X); T3:Commit; T1:W(Y); Commit

T1	T2	T3
RL(x)		
R(x)		
	WL(y)	
	W(Y)	
		RL(x)
		R(x)
	RL(x)	
	R(x)	
	RL(z)	
	R(z)	
	Commit	
	U(z)	
	U(x)	
	U(y)	
		WL(x) – holds
WL(y)		
W(y)		
Commit		
U(y)		
U(x)		
		WL(x) – granted
		W(x)
		Commit
		U(x)

2) Graph the following schedule. Is it conflict serializable?

T8:R(X); T9:R(Y); T8:W(Y); T9:W(X);T8:Commit; T9:Commit;

No, this schedule is not conflict serializable.

For this schedule to be conflict serializable it must be conflict equivalent to a serial schedule. For two schedules to be conflict equivalent, the schedules must be over the same operations of the same transactions, and they must order conflicting operations in the same order. Conflicting operations are two operations over the same data item, and at least one of them is a write.

So let's consider the two possible serial schedules of these transactions.

T8, T9	T9, T8	Our schedule
T8: R(x)	T9: R(y)	T8: R(x)
T8: W(y)	T9: W(x)	T9: R(y)
T9: R(y)	T8: R(x)	T8: W(y)
T9: W(x)	T8: W(y)	T9: W(x)

Our schedule is not equivalent to T8,T9 because the R and W of y are ordered differently. Our schedule is not equivalent to T9, T8 because the R and W of x are ordered differently. Therefore, our schedule is not equivalent to either of these serial schedules and since these are the only 2 serial schedules possible, we are not conflict serializable.

3) Using the timestamp method of creating conflict serialization, fill in the following chart. Which (if any) transactions are rolled back. T1's timestamp is 3, T2's timestamp is 4.

Schedule	Action	R-TS (X)	W-TS(X)	R-TS(Y)	W-TS(Y)
Initial Values		1	2	2	1
T1	R(Y)				
T2	R(X)				
T2	R(Y)				
T1	R(X)				
T2	W(Y)				
T1	W(X)				
T2	W(X)				
T1	R(X)				

Schedule	Action	R-TS (X)	W-TS(X)	R-TS(Y)	W-TS(Y)
Initial Values		1	2	2	1
T1	R(Y)			3	
T2	R(X)	4			
T2	R(Y)			4	
T1	R(X)	4			
T2	W(Y)				4
T1	W(X)	TS(t1) < RTS(X)	Rolled back		
T2	W(X)		4		
T1	R(X)				