7.27 Cont

Prove Correctness

ϕ is satisfiable $\Leftrightarrow$ G is 3colourable

1. Prove it forwards

ϕ is satisfiable $\rightarrow$ G is 3colorable

if x_i is true, color v_i True and $\bar{v}_i$ False

Also for each clause $C_j = (a \vee b \vee c)$ atleast one member must be colored true, then the OR gadget for C_j can be 3coloured st output = True ∴ proven

2. G is 3colourable $\rightarrow$ satisfiable

if v_i is true, then set x_i to be true (assignment) for any C clause, if all members cannot be false. If so, the output of OR-gadget for C_j has to be False but the output is connected to Base and False therefore 1,2 Proven

Both directions proven

Therefore reduction proper

Therefor 3 color is NP complete