Exercise 1

Prove that $Gap-2SAT\left[\frac{55}{80}+\epsilon,\frac{7}{10}\right]$ *is* $\mathbf{NP}$*-hard for any* $\epsilon>0$ *(hint: use reduction from E3SAT).*

Exercise 2

Represent the following conditions as constrained graph:

(1) G *is bipartite.*
(2) *A* $4NAE$ *formula is satisfiable.*
(3) G *contains hampath (hint: use* $|V|^3$ *colors).*

Exercise 3

(1) *Prove that it is* $\mathbf{NP}$*-hard to approximate* VC *within factor* $\frac{17}{16}-\epsilon$ *for any* $\epsilon>0$.
(2) *Recall that we used amplification to prove in class that it is* $\mathbf{NP}$*-hard to approximate* IS *within any constant factor. Can we use it to get more information about* VC*, then* $\mathbf{NP}$*-hardness of factor* $\frac{17}{16}-\epsilon$*?*

GOOD LUCK