Problem Set 8—Due 24 September 1999

Problem 24 Use the procedure from class (in the reduction of SAT to 3SAT) to convert the following formula into CNF:

$$(XYZW)(XYZ \Rightarrow \overline{W})$$

Problem 25 Use the procedure from class (in the reduction of 3SAT to CLIQUE) to covert the following formula into a graph G and a number k:

$$\phi = (X \vee Y \vee \overline{Z})(\overline{X} \vee Y \vee \overline{W})(\overline{W} \vee Y \vee \overline{Z})$$

Problem 26 In the problem called 3-COLOR you are given a graph $G = (V, E)$ and you should determine if G has a 3-coloring—that is, a way to paint the vertices with colors 1, 2, or 3 such that no adjacent vertices receive the same color. In the problem called 4-COLOR you are given a graph $G = (V, E)$ and you should determine if G has a 4-coloring—that is, a way to paint the vertices with colors 1, 2, 3 or 4 such that no adjacent vertices receive the same color. Show that 3-COLOR$\leq$4-COLOR.

Problem 27 In the BIG CIRCLE problem you are given a graph $G = (V, E)$ and you want to know if there is a simple cycle (you don't repeat a vertex or an edge) that goes through exactly half of the vertices. Show that BIG CIRCLE is NP-Complete.