Show all work. Unjustified answer yields no credit.

1. (7 points) Let $G$ and $H$ be two simple graphs on $n$ vertices. Show that $G$ and $H$ are isomorphic if an only if their complements $\overline{G}$ and $\overline{H}$ are isomorphic.

2. (3 points) Let $G = (V,E)$ be a simple graph. Assume that its chromatic number is 3. Add to $G$ one extra edge $e$ to obtain $H$. What is a minimal number of colors that will always suffice to color $H$. (Justify briefly.)

Example: $G = A \rightarrow B \rightarrow C \rightarrow A$, add one edge $H = K_4$. Every two vertices connected, you need 4 colors.