Problem 1
Let $H$ be a finite digraph. Show that $P(H)$ contains a loop if and only if $H$ contains a directed cycle.

Problem 2
Show that the previous statement is false for infinite digraphs $H$.

Problem 3
Up to isomorphism, there is only one unbalanced cycle $H$ on four vertices that is a core and not the directed cycle. Draw this graph. Show that AC does not solve CSP($H$).

Problem 4
Does the digraph
\[
\{(0, 1, 2, 3, 4, 5); \{(0, 1), (1, 2), (0, 2), (3, 2), (3, 4), (4, 5), (3, 5), (0, 5)\}\}
\]
have tree duality? Prove your answer.

Problem 5
Let $G$ and $H$ be finite digraphs that are homomorphically incomparable and suppose that CSP($G \uplus H$) is in P. Show that CSP($G$) and CSP($H$) are in P, too.