1) For the graph given above in Figure 1, …
   a) … run a BFS starting in vertex $a$. Show the produced tree.
   b) … run a DFS starting in vertex $a$ and identify tree, forward, back, and cross edges.

2) Consider a graph $G = (V, E)$ whose edges are marked red or blue. An alternating path is a path whose edges alternate in colour (red, blue, red, …; or blue, red, blue …). The alternating distance from vertex $u$ to vertex $v$ is the length of the shortest alternating path from $u$ to $v$. Determine in linear time the alternating distance from a source vertex $s$ to all vertices.

3) In a given directed graph $G$, a vertex $u$ is reachable from a vertex $v$ if there is a directed path from $v$ to $u$. Give an efficient algorithm to test whether $G$ contains a vertex $v$ such that every vertex $u$ is reachable from $v$. State the time complexity of your algorithm.