Exercise 4.3.12: Suppose that a graph has distinct edge weights. Does its shortest edge have to belong to the MST? Can its longest edge belong to the MST? Does a min-weight edge on every cycle have to belong to the MST? Prove your answer to each question or give a counterexample.

Solution:

1. Yes, it must because it is first edge created using Kruskalls as it picks in ascending order for edges.

2. The heaviest edge could belong if it is the only edge connecting a node to rest of the graph.

3. No, the statement 'Min weight edge of a cycle must exist because all edges except longest edge in a cycle exist' is false. Every min weight edge in every cycle DOES NOT have to belong to the MST.