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Locating a Robber on a Caterpillar

Consider the following game of a cop locating a robber on a connected graph. At each turn, the cop chooses a vertex of the graph to probe and receives the distance from the probe to the robber. If she can uniquely locate the robber after this probe, then she wins. Otherwise the robber may stay put or move to any vertex adjacent to his location other than the probe. The cop's goal is to minimize the number of probes required to locate the robber; the robber's goal is to avoid being located. We consider an optimal cop strategy for caterpillars.