AIP: Tutorial 5

Question 1

Intensification refers to focusing the search around a specific node, usually because the algorithm believes the goal to be nearby. **Diversification** refers to the process of trying various different approaches, often in the hope of 'brute-forcing' past an uninformative heuristic.

- Using a small probe-depth bound would decrease intensification by lowering the extent to which the planner explores one single path.
- Using $1/h^3$ instead of $1/h$ in roulette selection would decrease diversification by increasing bias towards lower-heuristic states.
- Using a random filter that keeps just two applicable actions would increase diversification.
- Using a random successor selector would increase diversification.

Question 2

If using A* search with $f(s) = g(s) + h(s)$ and assuming a consistent heuristic, an action with zero cost (even if it was the right action) would actually increase $f(s)$ because $g(s)$ would increase and $h(s)$ would remain the same.

Question 3

All 9001 states will be expanded, because the states $S1 - S9000$ have a better $f(s) = g(s) + h(s) = 10 + 20 = 30$ value than $S9001$, which has $f(s) = g(s) + h(s) = 11 + 100 = 111$.

BEES, on the other hand, would select $S9001$ first because it 'qualifies' for the focal list ($111 \leq 150$) and it has the smallest d value.

Question 4

A* with an RNG heuristic alone is bad, but combining an RNG heuristic with a good one can help to find plans quicker by providing two 'voices', thereby helping with diversification and giving the planner a chance of quickly bluffing its way out of plateaus.

This is a similar idea to roulette selection, which is *biased* towards a hopefully informative heuristic, but sometimes ignores it and does something random instead.