Exercise 2.1

(a) $g(n)$ denotes the path cost from the root of the search tree to node n. Since the Greedy Search always expands the node n^* where $h(n^*) = g(n^*)$ is minimal, the resulting algorithm can be described as a shortest path search (or lowest cost search) algorithm.

(b) Since $d(n)$ denotes the depth of a node n in the search tree and the Greedy Search always expands the node n^* where $h(n^*) = d(n^*)$ is minimal (so minimal depth), the resulting algorithm is a BFS.

(c) $\frac{1}{1+d(n)}$ is inversely proportional to the depth of node n in the search tree. Therefore, the Greedy Search always expands the node n^* with the largest depth. So we get an DFS algorithm.

Exercise 2.2

1)

An admissible heuristic is a function that never overestimates the cost of the minimum cost path from a node to the goal node. Let $h^*(n)$ be the optimal cost to reach the goal from n. If h is admissible, then $\forall n : h(n) \leq h^*(n)$.

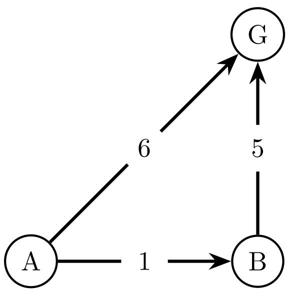
Let h be consistent.
Suppose there is not path from n to the goal state. Then $h^*(n) = \infty$, therefore $h(n) \leq h^*(n)$.
Now suppose that there is some path from n to te goal state g. Let $(n, x_1, \dots, x_m, g)$ be the shortest path from n to the goal state g with corresponding actions $(a_n, a_{x_1}, \dots, a_{x_m})$.

Induction:
Consider x_m. $h(x_m) \leq c(x_m, a_{x_m}, g) + h(g) \overset{h(g)=0}{=} c(x_m, a_{x_m}, g) = h^*(x_m)$.
Similarly x_{m-1}. $h(x_{m-1}) \leq c(x_{m-1}, a_{x_{m-1}}, x_m) + h(x_m) = c(x_{m-1}, a_{x_{m-1}}, x_m) + c(x_m, a_{x_m}, g) = h^*(x_{m-1})$.
By induction on the shortest past we get $h(n) \leq c(n, a_n, x_1) + c(x_m, a_{x_m}, g) = h^*(n)$, which is of course the shortest path cost.

Therefore when a heuristic is consistent, it is admissible.

2)

Let there be the graph with goal node G:



Node n	$h^*(n)$
A	6
B	5
G	0

An admissible heuristic, that is not consistent:

Node n	$h(n)$
A	6
B	1
G	0

Exercise 2.3

Exercise 2.4