2019

1.

1.a.

Is admissible(at least for this specific graph), since every nodes has a shortest path longer than the heuristic at that node.

Is valid, because h is never negative.

1.b.

triangle inequality

1.c.

	<f, g, h, X>
0	<13, 0, 13, A>
1	<13, 2, 11, C>, <15, 6, 9, B>
2	<13, 6, 7, D>, <14, 5, 9, B>, <14, 10, 4, E>
3	<13, 9, 4, E>, <14, 14, 0, F>, <14, 5, 9, B>
4	<13, 13, 0, F>, <14, 5, 9, B>

2.

2.a.

2.a.1.

(1) $(X \land Y) \implies \neg Z \land \neg W$

(2) $(\neg X \lor \neg Y) \implies W$

2.a.2.

(1)

$(X \land Y) \implies \neg Z \land \neg W$

$\equiv \neg (X \land Y) \lor (\neg Z \land \neg W)$ [implication elimination]

$\equiv (\neg X \lor \neg Y) \lor (\neg Z \land \neg W)$ [De Morgan]

$\equiv (((\neg X \lor \neg Y) \lor \neg Z) \land ((\neg X \lor \neg Y) \lor \neg W))$ [distributivity of $\lor$ over $\land$]

$\equiv (\neg X \lor \neg Y \lor \neg Z) \land (\neg X \lor \neg Y \lor \neg W)$ [simplify brackets]

(2)

$(\neg X \lor \neg Y) \implies W$

$\equiv \neg (\neg X \lor \neg Y) \lor W$ [implication elimination]

$\equiv (X \land Y) \lor W$ [De Morgan]

$\equiv (W \lor X) \land (W \lor Y)$ [distributivity of $\lor$ over $\land$]

2.b

$\neg X \implies \neg Z \land \neg W$

$\equiv \neg (\neg Z \land \neg W) \implies X$ [contraposition]

$\equiv (Z \lor W) \implies X$ [De Morgan]