

# Assignment 1

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## Task 2

Figure 1: Solvable and unsolvable 5x5 puzzle

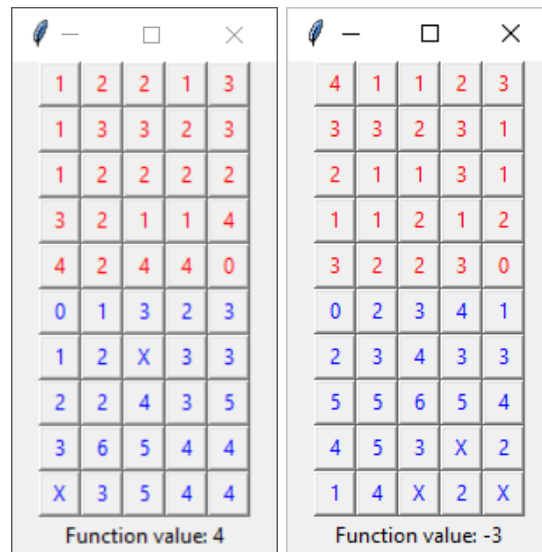



Figure 2: Solvable and unsolvable 7x7 puzzle

	-	<input type="checkbox"/>	×
2	5	3	6
5	2	3	5
1	5	4	2
6	5	3	1
2	4	4	2
3	5	1	2
2	2	6	5
0	7	1	3
2	X	5	5
1	2	4	5
2	X	2	4
4	6	5	5
5	7	X	6
3	X	3	4
Function value: 5			

	-	<input type="checkbox"/>	×
5	3	5	2
1	1	3	2
2	3	2	1
1	2	3	3
2	5	4	2
5	3	5	3
2	4	3	6
0	X	X	X
X	X	X	X
X	X	X	X
X	X	X	X
X	X	X	X
1	X	X	X
X	X	X	X
Function value: -45			

Figure 3: Solvable and unsolvable 9x9 puzzle

 tk	-	<input type="checkbox"/>	×
7	7	7	1
3	6	3	5
6	7	5	2
6	2	2	4
1	1	6	4
4	4	5	2
1	2	2	6
6	4	7	5
7	6	8	4
0	X	5	5
2	6	X	3
X	6	5	5
4	5	X	6
3	4	5	5
4	5	4	X
7	8	X	4
1	7	6	4
X	9	X	4
Function value: 7			


 tk	-	<input type="checkbox"/>	×
6	1	4	4
3	7	5	2
7	1	4	1
2	3	5	4
4	3	3	2
6	4	1	3
5	3	4	3
5	4	7	4
3	4	3	4
0	6	6	X
2	4	6	3
X	X	8	7
7	5	8	4
3	6	7	6
5	4	7	8
1	6	7	7
X	4	8	5
4	5	6	5
Function value: -11			

Figure 4: Solvable and unsolvable 11x11 puzzle

tk	—	□	×
5	7	3	6
9	9	1	8
7	8	4	1
4	4	6	1
3	2	7	5
8	2	2	1
2	1	4	6
9	5	5	4
2	6	1	3
6	9	3	8
10	7	4	1
0	9	X	5
6	X	X	6
6	4	5	5
7	5	5	4
5	X	X	5
1	4	4	5
4	3	4	4
6	4	5	X
5	7	6	5
7	8	6	5
6	5	5	X
Function value: 5			

tk	—	□	×
2	3	10	9
1	1	5	1
9	1	7	2
10	6	8	4
3	7	5	7
6	6	1	6
10	5	2	4
8	8	8	6
6	4	8	5
10	9	8	2
7	7	10	2
0	5	1	10
6	5	5	13
1	6	3	9
9	6	12	11
7	12	7	8
8	10	9	10
7	X	6	8
8	X	X	12
X	11	7	10
X	4	4	11
12	10	2	9
Function value: -14			

### Task 3

Figure 5: 5x5 puzzle hill climbing results at 100, 1000, and 10000 iterations. Run times were 0.2, 2.1, and 20.4 seconds respectively

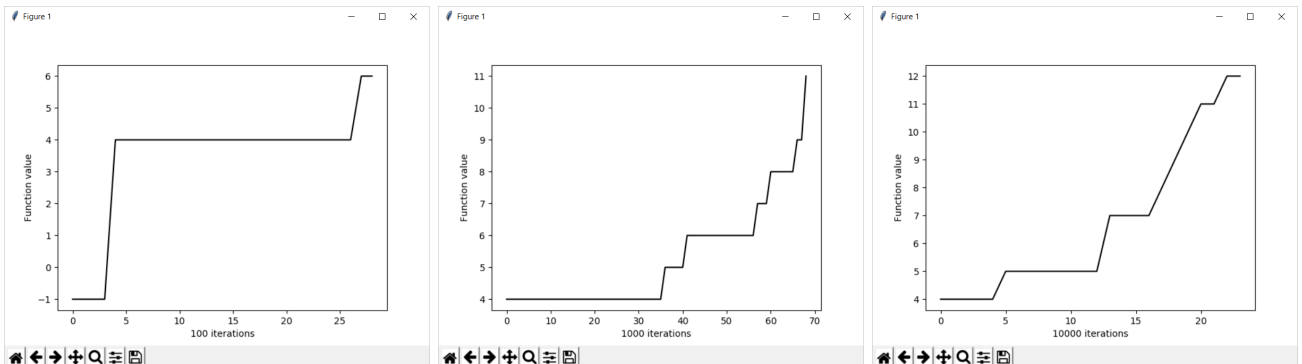


Figure 6: 7x7 puzzle hill climbing results at 100, 1000, and 10000 iterations. Run times were 1.1, 9.9, and 96.7 seconds respectively

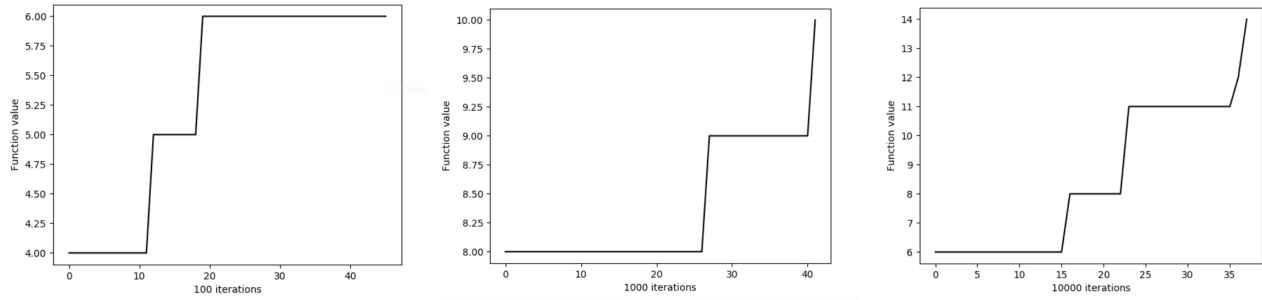


Figure 7: 9x9 puzzle hill climbing results at 100, 500, and 1000 iterations. Run times were 3.2, 17, and 33.4 seconds respectively

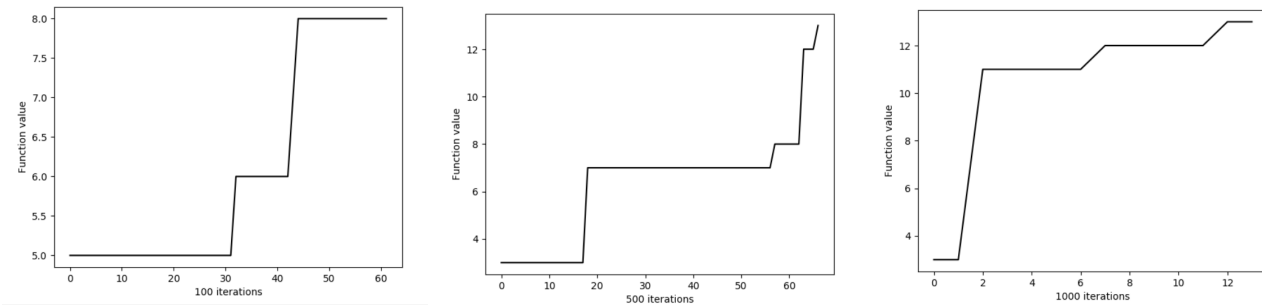
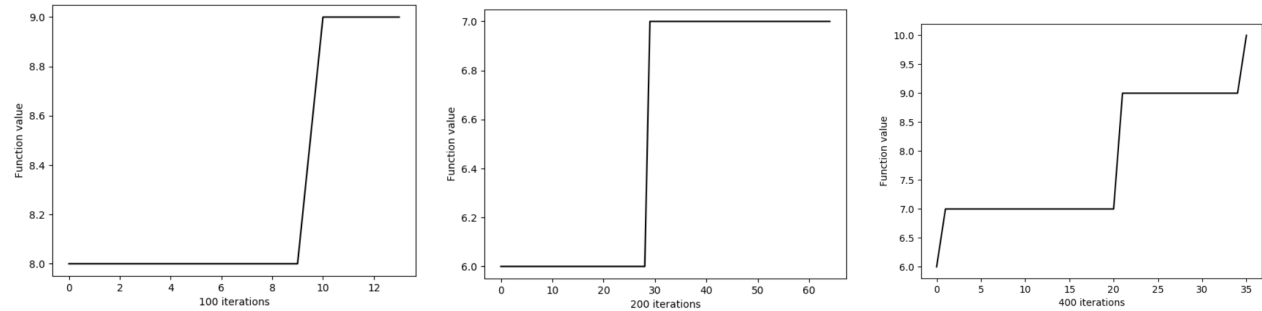


Figure 8: 11x11 puzzle hill climbing results at 100, 200, and 400 iterations. Run times were 8.7, 16.1, and 34.9 seconds respectively



## Task 4

Figure 9: 5x5 puzzle hill climbing with random restarts results at 200x5, 2000x5, and 200x50 iterations. Run times were 2.1, 21, and 19.4 seconds respectively

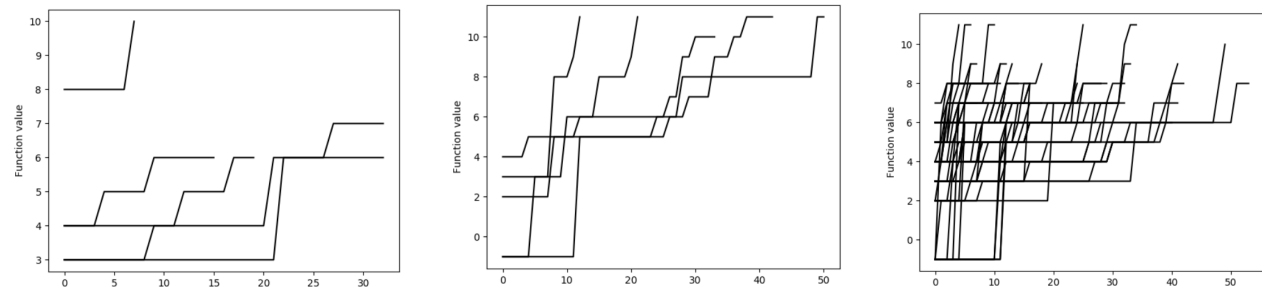


Figure 10: 7x7 puzzle hill climbing with random restarts results at 200x5, 2000x5, and 200x50 iterations. Run times were 9.4, 93.4, and 95.9 seconds respectively

