EXAMPLE PROGRAM TRACES

BFS:

```
$ ./Search_Graph bfs
vertices=275, edges=641
Enter starting node coords x,y:
1 1
Enter ending node coords x,y:
4 4
start=(1,1), goal=(4,4), vertices: 0 and 62
iter=1, frontier=1, popped=0 (1,1), depth=0, dist2goal=4.24264
 pushed 1 (1,2)
 pushed 20 (2,1)
 pushed 21 (2,2)
iter=2, frontier=3, popped=1 (1,2), depth=1, dist2goal=3.60555
 pushed 2 (1,3)
 pushed 22 (2,3)
iter=3, frontier=4, popped=20 (2,1), depth=1, dist2goal=3.60555
 pushed 40 (3,1)
 pushed 41 (3,2)
iter=4, frontier=5, popped=21 (2,2), depth=1, dist2goal=2.82843
 pushed 42 (3,3)
iter=5, frontier=5, popped=2 (1,3), depth=2, dist2goal=3.16228
 pushed 3 (1,4)
 pushed 23 (2,4)
iter=6, frontier=6, popped=22 (2,3), depth=2, dist2goal=2.23607
 pushed 43 (3,4)
iter=7, frontier=6, popped=40 (3,1), depth=2, dist2goal=3.16228
 pushed 59 (4,1)
 pushed 60 (4,2)
iter=8, frontier=7, popped=41 (3,2), depth=2, dist2goal=2.23607
 pushed 61 (4,3)
iter=9, frontier=7, popped=42 (3,3), depth=2, dist2goal=1.41421
 pushed 62 (4,4)
iter=10, frontier=7, popped=3 (1,4), depth=3, dist2goal=3
 pushed 4 (1,5)
 pushed 24 (2,5)
iter=11, frontier=8, popped=23 (2,4), depth=3, dist2goal=2
 pushed 44 (3,5)
iter=12, frontier=8, popped=43 (3,4), depth=3, dist2goal=1
 pushed 63 (4,5)
iter=13, frontier=8, popped=59 (4,1), depth=3, dist2goal=3
 pushed 75 (5,1)
```

```
 pushed 76 (5,2)
iter=14, frontier=9, popped=60 (4,2), depth=3, dist2goal=2
 pushed 77 (5,3)
iter=15, frontier=9, popped=61 (4,3), depth=3, dist2goal=1
iter=16, frontier=8, popped=62 (4,4), depth=3, dist2goal=0
==============
solution path:
 vertex 0 (1,1)
 vertex 21 (2,2)
 vertex 42 (3,3)
 vertex 62 (4,4)
search algorithm        = BFS
total iterations        = 16
max frontier size       = 9
vertices visited        = 23/275
path length             = 3
```

DFS:

```
$ ./Search_Graph dfs
vertices=275, edges=641
Enter starting node coords x,y:
1 1
Enter ending node coords x,y:
4 4
start=(1,1), goal=(4,4), vertices: 0 and 62
iter=1, frontier=1, popped=0 (1,1), depth=0, dist2goal=4.24264
 pushed 1 (1,2)
 pushed 20 (2,1)
 pushed 21 (2,2)
iter=2, frontier=3, popped=21 (2,2), depth=1, dist2goal=2.82843
 pushed 22 (2,3)
 pushed 41 (3,2)
 pushed 42 (3,3)
iter=3, frontier=5, popped=42 (3,3), depth=2, dist2goal=1.41421
 pushed 43 (3,4)
 pushed 61 (4,3)
 pushed 62 (4,4)
iter=4, frontier=7, popped=62 (4,4), depth=3, dist2goal=0
==============
solution path:
 vertex 0 (1,1)
 vertex 21 (2,2)
```

```
 vertex 42 (3,3)
 vertex 62 (4,4)
search algorithm      = DFS
total iterations      = 4
max frontier size     = 7
vertices visited      = 10/275
path length           = 3
```

GBFS:

```
$ ./Search_Graph gbfs
vertices=275, edges=641
Enter starting node coords x,y:
1 1
Enter ending node coords x,y:
4 4
start=(1,1), goal=(4,4), vertices: 0 and 62
iter=1, frontier=1, popped=0 (1,1), depth=0, dist2goal=4.24264
 pushed 1 (1,2)
 pushed 20 (2,1)
 pushed 21 (2,2)
iter=2, frontier=3, popped=21 (2,2), depth=1, dist2goal=2.82843
 pushed 22 (2,3)
 pushed 41 (3,2)
 pushed 42 (3,3)
iter=3, frontier=5, popped=42 (3,3), depth=2, dist2goal=1.41421
 pushed 43 (3,4)
 pushed 61 (4,3)
 pushed 62 (4,4)
iter=4, frontier=7, popped=62 (4,4), depth=3, dist2goal=0
==============
solution path:
 vertex 0 (1,1)
 vertex 21 (2,2)
 vertex 42 (3,3)
 vertex 62 (4,4)
search algorithm      = GBFS
total iterations      = 4
max frontier size     = 7
vertices visited      = 10/275
path length           = 3
```