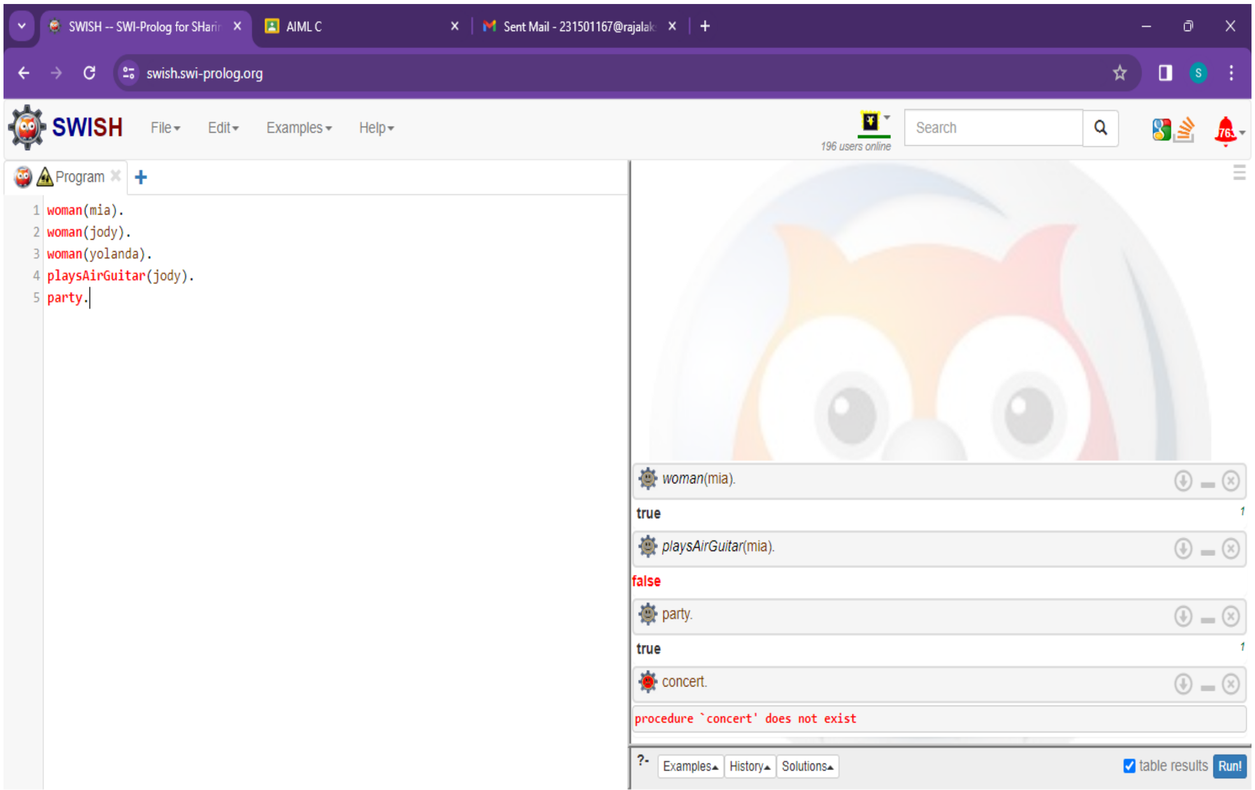
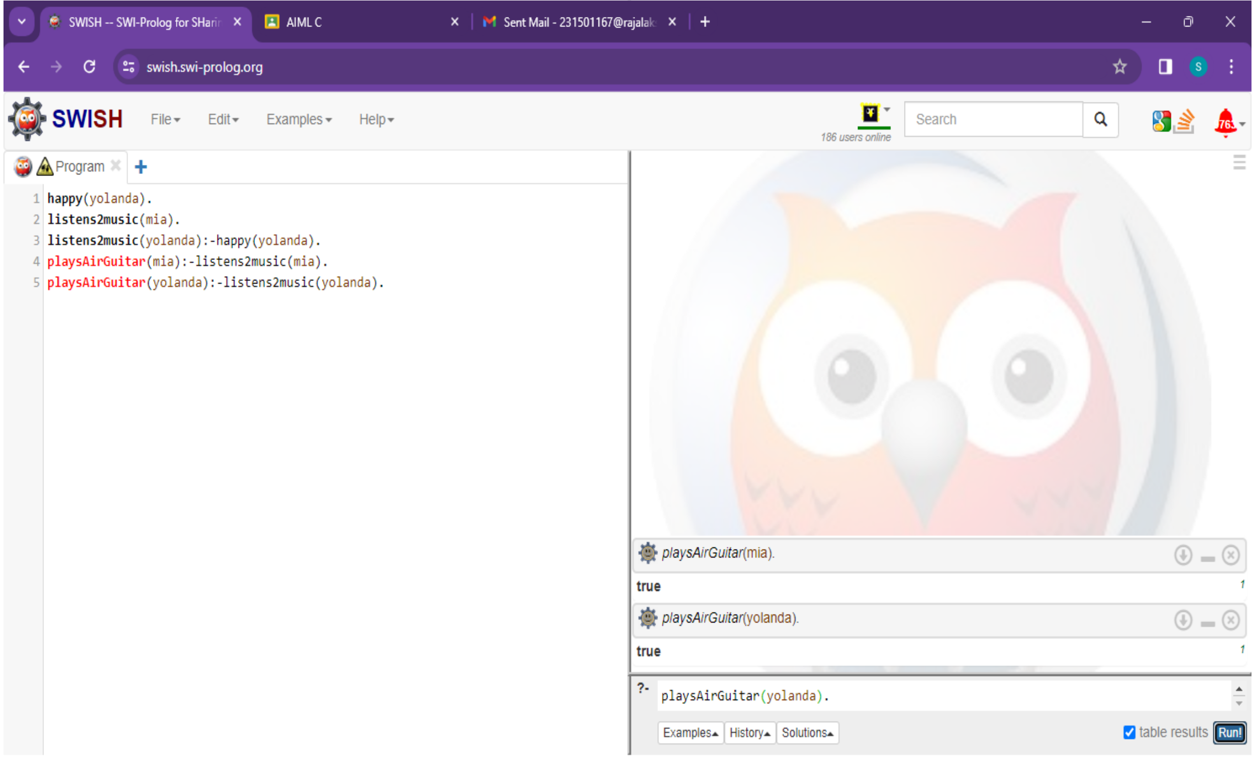


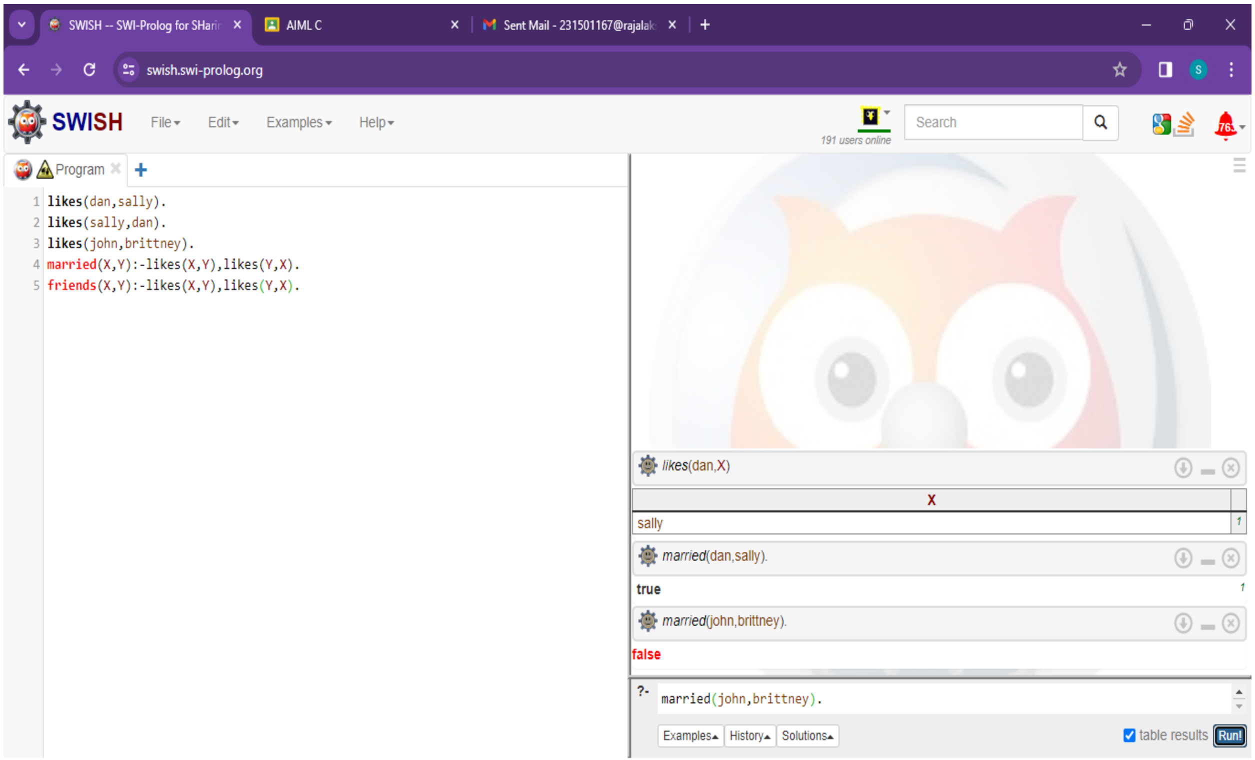
```
woman(mia).
woman(jody).
woman(yolanda).
playsAirGuitar(jody).
party.
```

```
woman(mia).
true

playsAirGuitar(mia).
false

party.
true

concert.
procedure `concert' does not exist
```



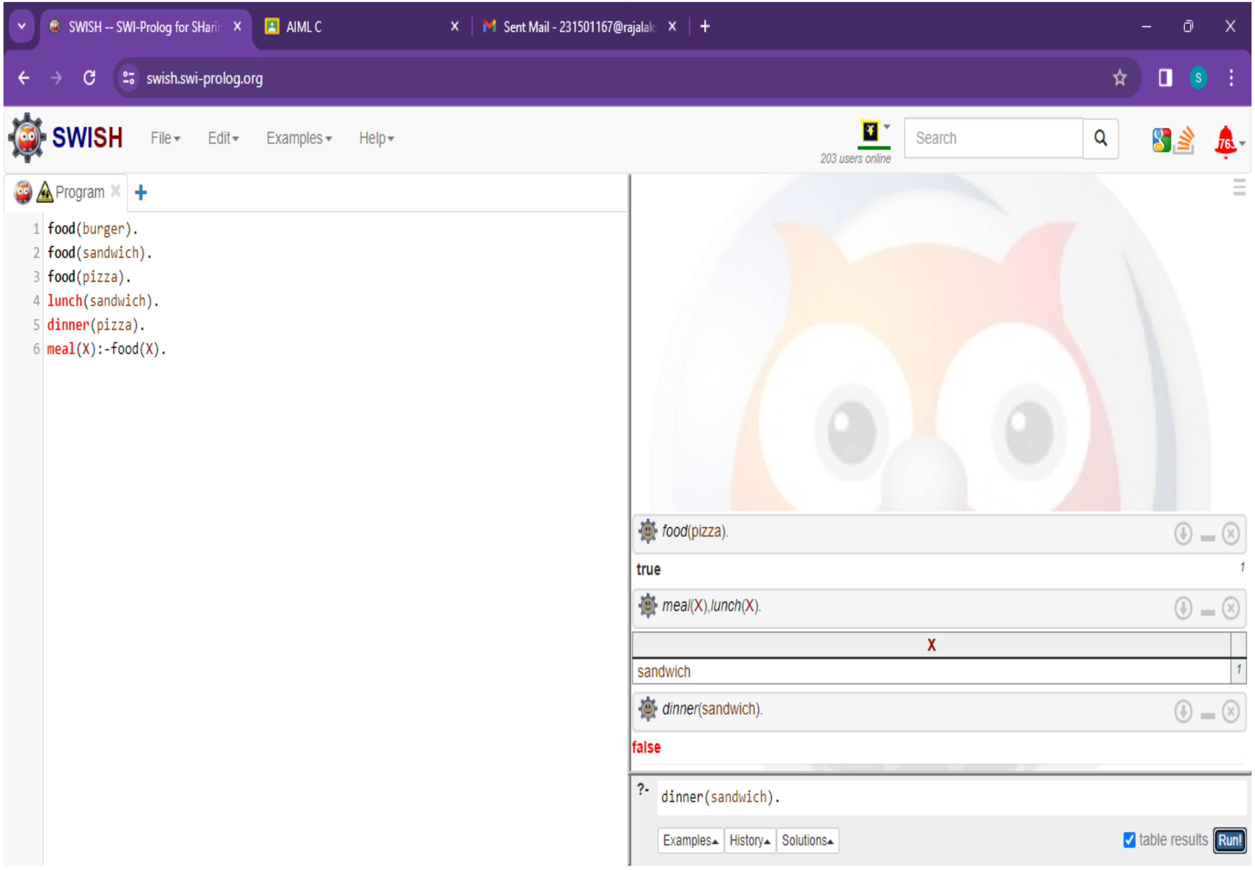
```
happy(yolanda).
listens2music(mia).
listens2music(yolanda):-happy(yolanda).
playsAirGuitar(mia):-listens2music(mia).
playsAirGuitar(yolanda):-listens2music(yolanda).
```

```
playsAirGuitar(mia).
true

playsAirGuitar(yolanda).
true

?- playsAirGuitar(yolanda).
```



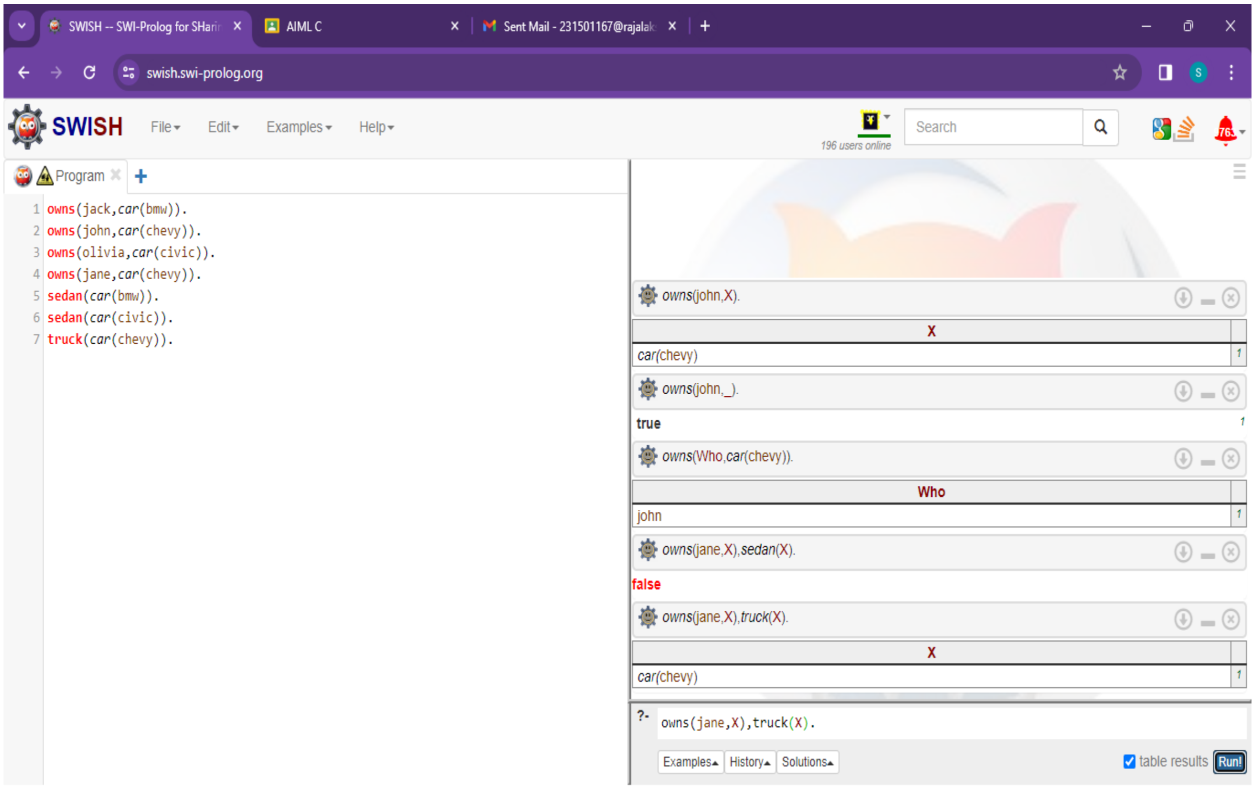
```
likes(dan,sally).
likes(sally,dan).
likes(john,brittney).
married(X,Y):-likes(X,Y),likes(Y,X).
friends(X,Y):-likes(X,Y),likes(Y,X).
```

```
likes(dan,X)
X
sally
married(dan,sally).
true
married(john,brittney).
false
?- married(john,brittney).
```



```
food(burger).
food(sandwich).
food(pizza).
lunch(sandwich).
dinner(pizza).
meal(X):-food(X).
```

```
food(pizza).
true
meal(X),lunch(X).
X
sandwich
dinner(sandwich).
false
?- dinner(sandwich).
```



```
owns(jack,car(bmw)).
owns(john,car(chevy)).
owns(olivia,car(civic)).
owns(jane,car(chevy)).
sedan(car(bmw)).
sedan(car(civic)).
truck(car(chevy)).
```

owns(john,X).

| X |
|---|
| car(chevy) |

owns(john,_).

true

owns(Who,car(chevy)).

| Who |
|---|
| john |

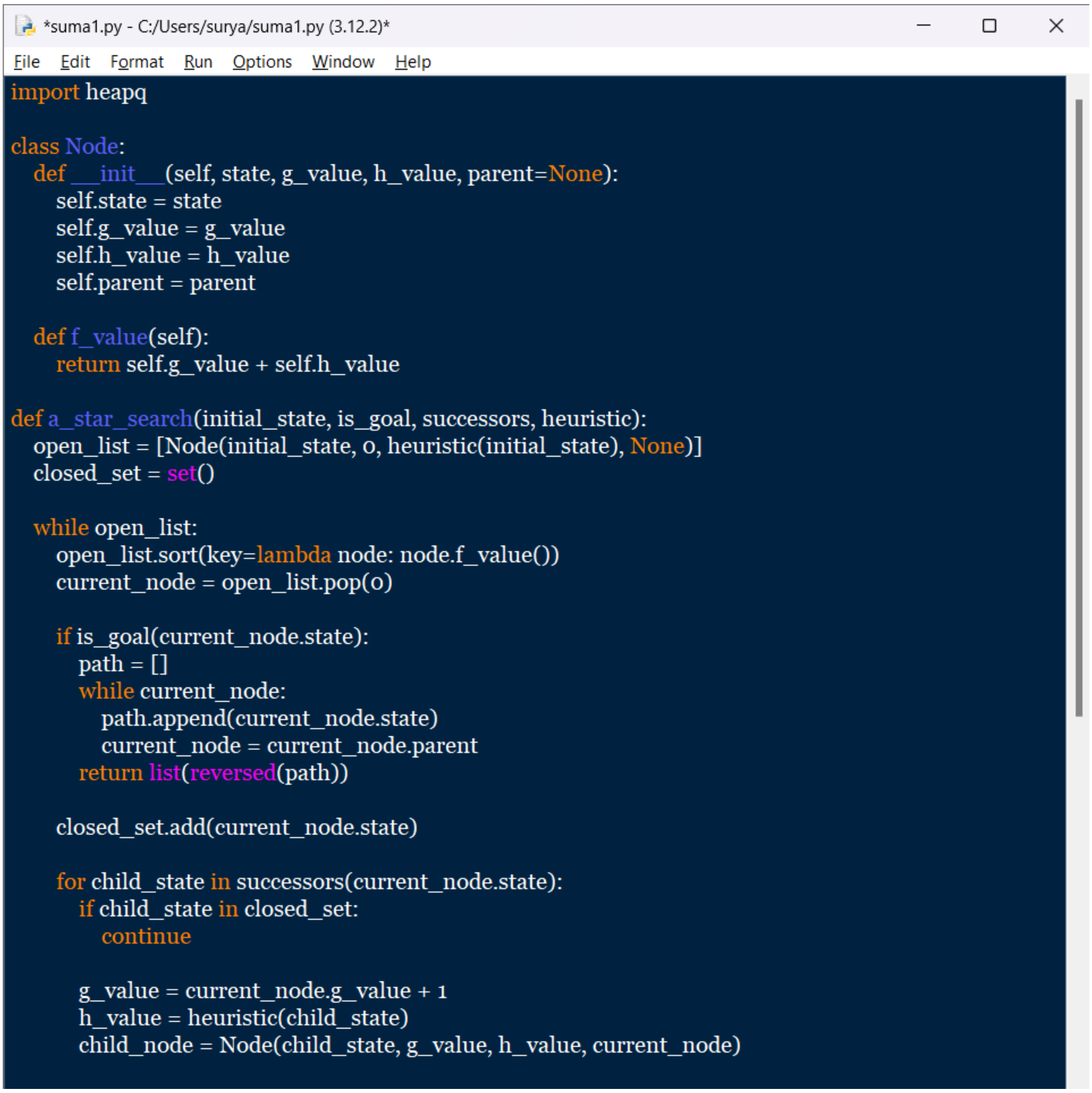
owns(jane,X),sedan(X).

false

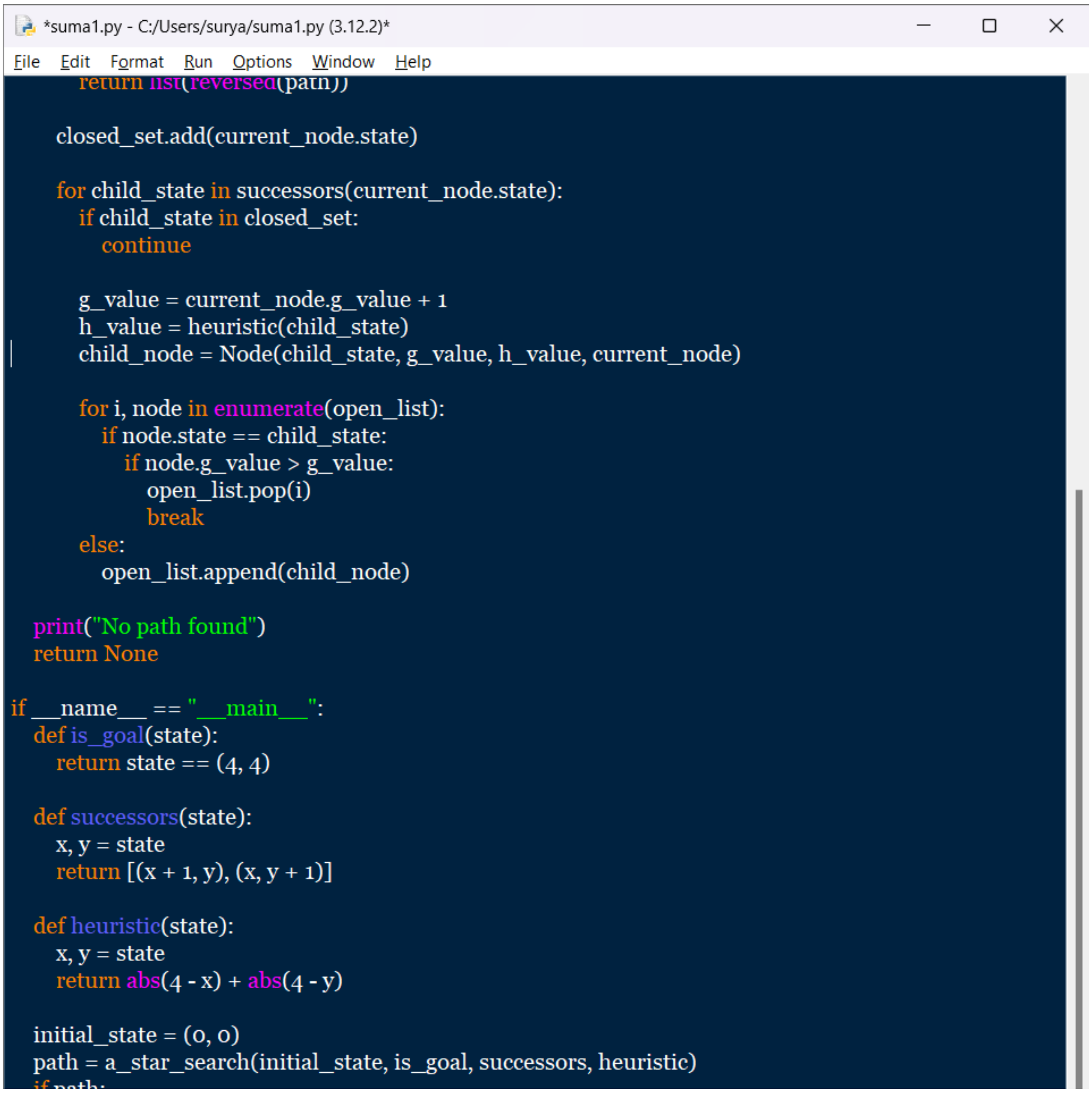
owns(jane,X),truck(X).

| X |
|---|
| car(chevy) |

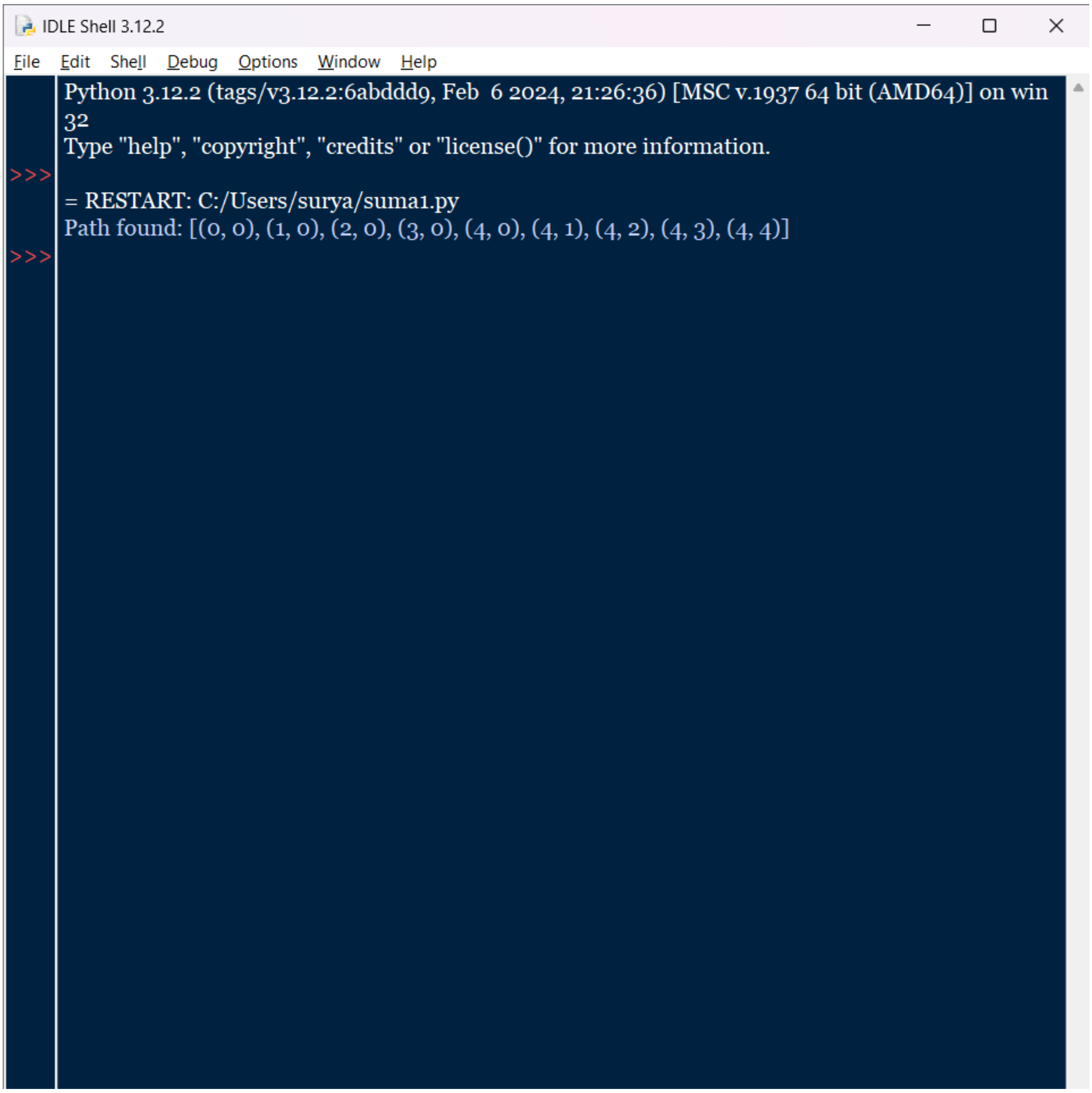
```
?- owns(jane,X),truck(X).
```



```python
import heapq

class Node:
    def __init__(self, state, g_value, h_value, parent=None):
        self.state = state
        self.g_value = g_value
        self.h_value = h_value
        self.parent = parent

    def f_value(self):
        return self.g_value + self.h_value

def a_star_search(initial_state, is_goal, successors, heuristic):
    open_list = [Node(initial_state, 0, heuristic(initial_state), None)]
    closed_set = set()

    while open_list:
        open_list.sort(key=lambda node: node.f_value())
        current_node = open_list.pop(0)

        if is_goal(current_node.state):
            path = []
            while current_node:
                path.append(current_node.state)
                current_node = current_node.parent
            return list(reversed(path))

        closed_set.add(current_node.state)

        for child_state in successors(current_node.state):
            if child_state in closed_set:
                continue

            g_value = current_node.g_value + 1
            h_value = heuristic(child_state)
            child_node = Node(child_state, g_value, h_value, current_node)
```


*suma1.py - C:/Users/surya/suma1.py (3.12.2)*
File Edit Format Run Options Window Help

```
            return list(reversed(path))

        closed_set.add(current_node.state)

        for child_state in successors(current_node.state):
            if child_state in closed_set:
                continue

            g_value = current_node.g_value + 1
            h_value = heuristic(child_state)
            child_node = Node(child_state, g_value, h_value, current_node)

            for i, node in enumerate(open_list):
                if node.state == child_state:
                    if node.g_value > g_value:
                        open_list.pop(i)
                        break
            else:
                open_list.append(child_node)

    print("No path found")
    return None

if __name__ == "__main__":
    def is_goal(state):
        return state == (4, 4)

    def successors(state):
        x, y = state
        return [(x + 1, y), (x, y + 1)]

    def heuristic(state):
        x, y = state
        return abs(4 - x) + abs(4 - y)

    initial_state = (0, 0)
    path = a_star_search(initial_state, is_goal, successors, heuristic)
    if path:
```



```
Python 3.12.2 (tags/v3.12.2:6abddd9, Feb  6 2024, 21:26:36) [MSC v.1937 64 bit (AMD64)] on win
32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: C:/Users/surya/suma1.py
Path found: [(0, 0), (1, 0), (2, 0), (3, 0), (4, 0), (4, 1), (4, 2), (4, 3), (4, 4)]
>>>
```