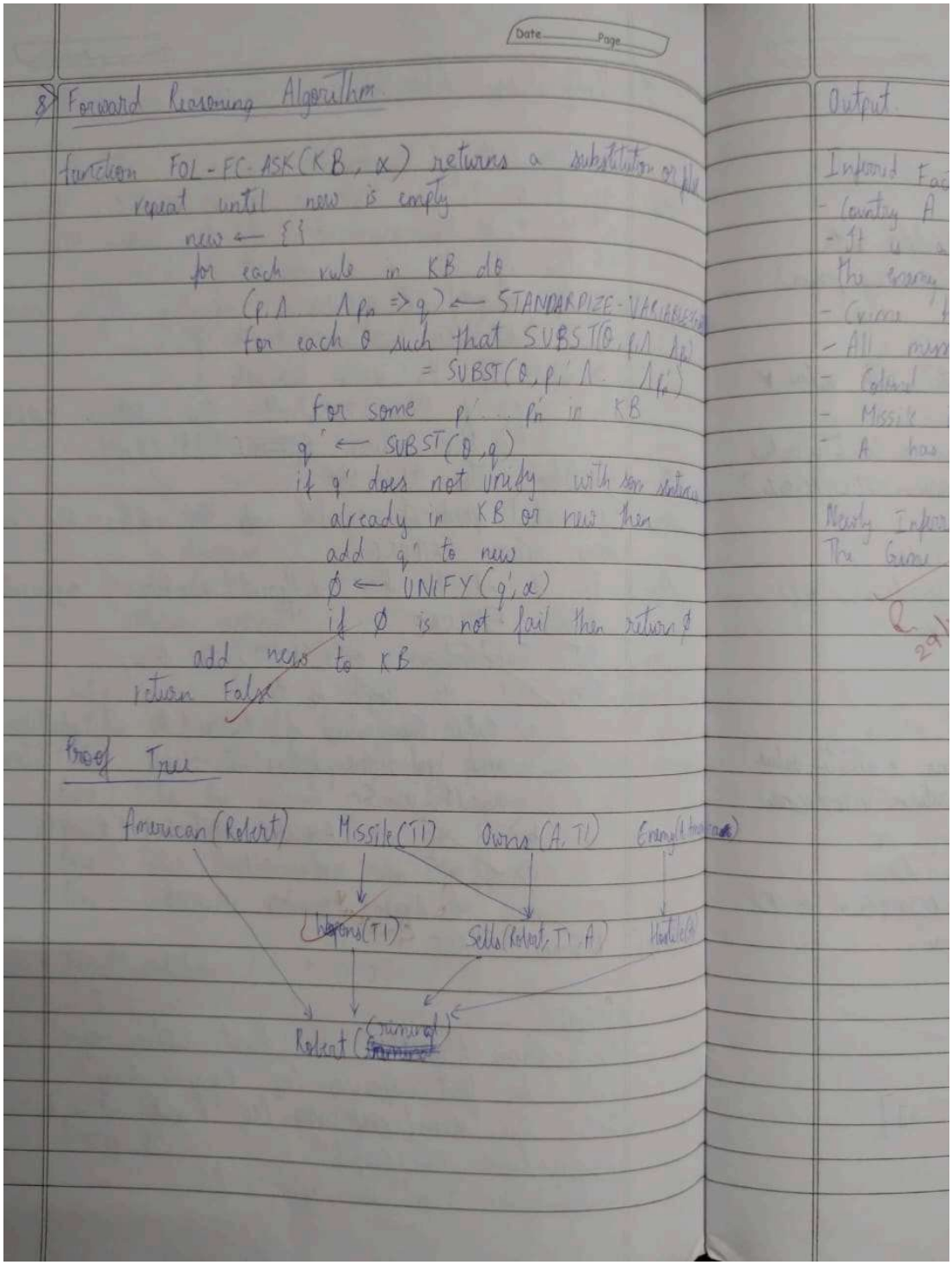
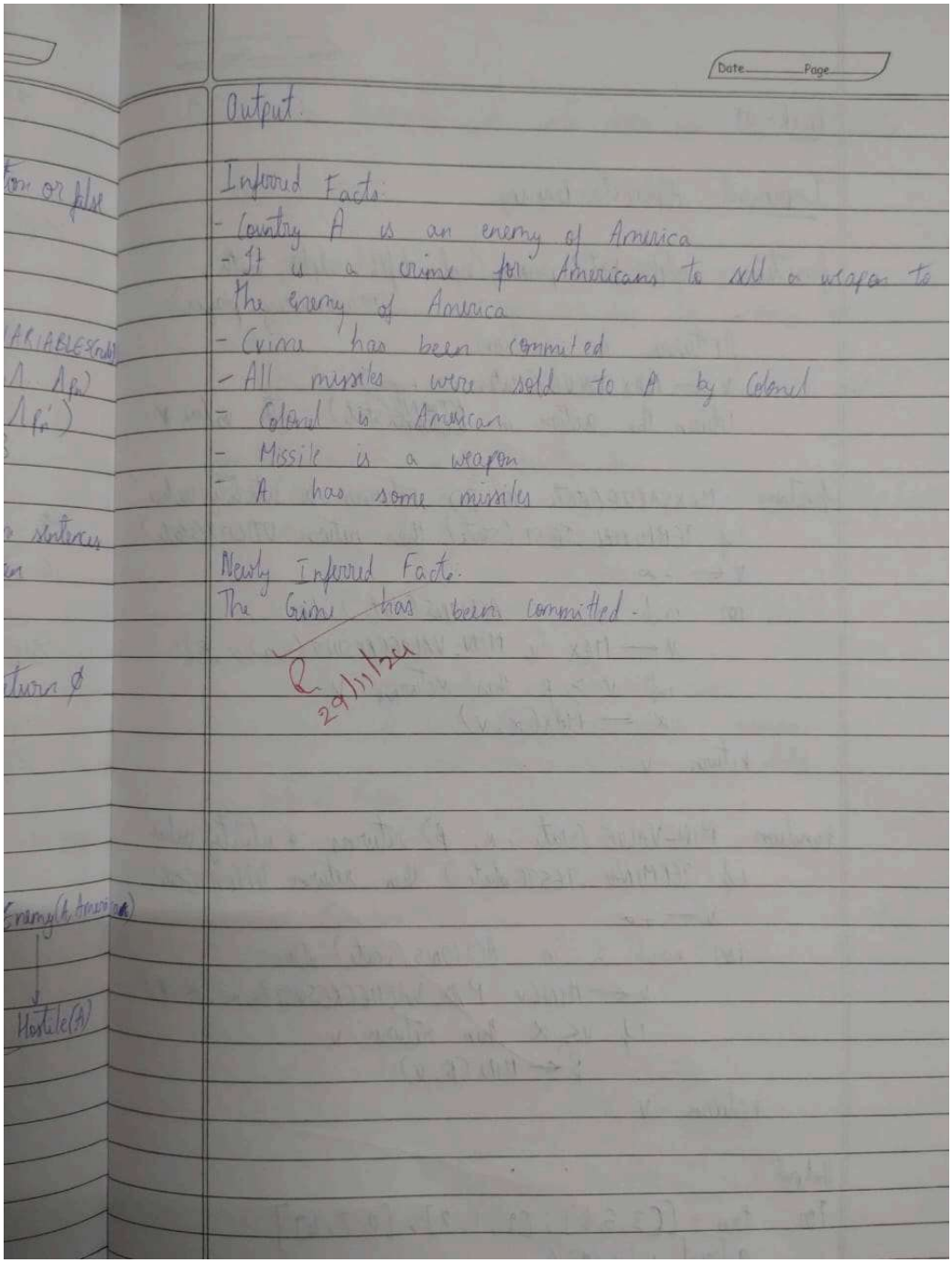
Forward Reasoning Algorithm:





Output:

Inferred Facts:
- Country A is an enemy of America
- It is a crime for Americans to sell a weapon to the enemy of America
- Crime has been committed
- All missiles were sold to A by Colonel
- Colonel is American
- Missile is a weapon
- A has some missiles

Newly Inferred Facts:
The Crime has been committed.

29/11/24

Code:

```
class KnowledgeBase:
    def __init__(self):
        self.facts = set()    # Set of known facts
        self.rules = []       # List of rules


    def add_fact(self, fact):
        self.facts.add(fact)


    def add_rule(self, rule):
        self.rules.append(rule)


    def infer(self):
        inferred = True
        while inferred:
            inferred = False
            for rule in self.rules:
                if rule.apply(self.facts):
                    inferred = True


# Define the Rule class
class Rule:
    def __init__(self, premises, conclusion):
        self.premises = premises  # List of conditions
        self.conclusion = conclusion  # Conclusion to add if premises are met


    def apply(self, facts):
        if all(premise in facts for premise in self.premises):
            if self.conclusion not in facts:
                facts.add(self.conclusion)
```

```
                print(f"Inferred: {self.conclusion}")
                return True
        return False


# Initialize the knowledge base
kb = KnowledgeBase()


# Facts in the problem
kb.add_fact("American(Robert)")
kb.add_fact("Missile(T1)")
kb.add_fact("Owns(A, T1)")
kb.add_fact("Enemy(A, America)")


# Rules based on the problem
# 1. Missile(x) implies Weapon(x)
kb.add_rule(Rule(["Missile(T1)"], "Weapon(T1)"))


# 2. Enemy(x, America) implies Hostile(x)
kb.add_rule(Rule(["Enemy(A, America)"], "Hostile(A)"))


# 3. Missile(x) and Owns(A, x) imply Sells(Robert, x, A)
kb.add_rule(Rule(["Missile(T1)", "Owns(A, T1)"], "Sells(Robert, T1, A)"))


# 4. American(p) and Weapon(q) and Sells(p, q, r) and Hostile(r) imply
Criminal(p)
kb.add_rule(Rule(["American(Robert)", "Weapon(T1)", "Sells(Robert, T1, A)",
"Hostile(A)"], "Criminal(Robert)"))


# Infer new facts based on the rules
kb.infer()
```

```
# Check if Robert is a criminal
if "Criminal(Robert)" in kb.facts:
    print("Conclusion: Robert is a criminal.")
else:
    print("Conclusion: Unable to prove Robert is a criminal.")
```

Output:

Inferred: Weapon(T1)

Inferred: Hostile(A)

Inferred: Sells(Robert, T1, A)

Inferred: Criminal(Robert)

Conclusion: Robert is a criminal.