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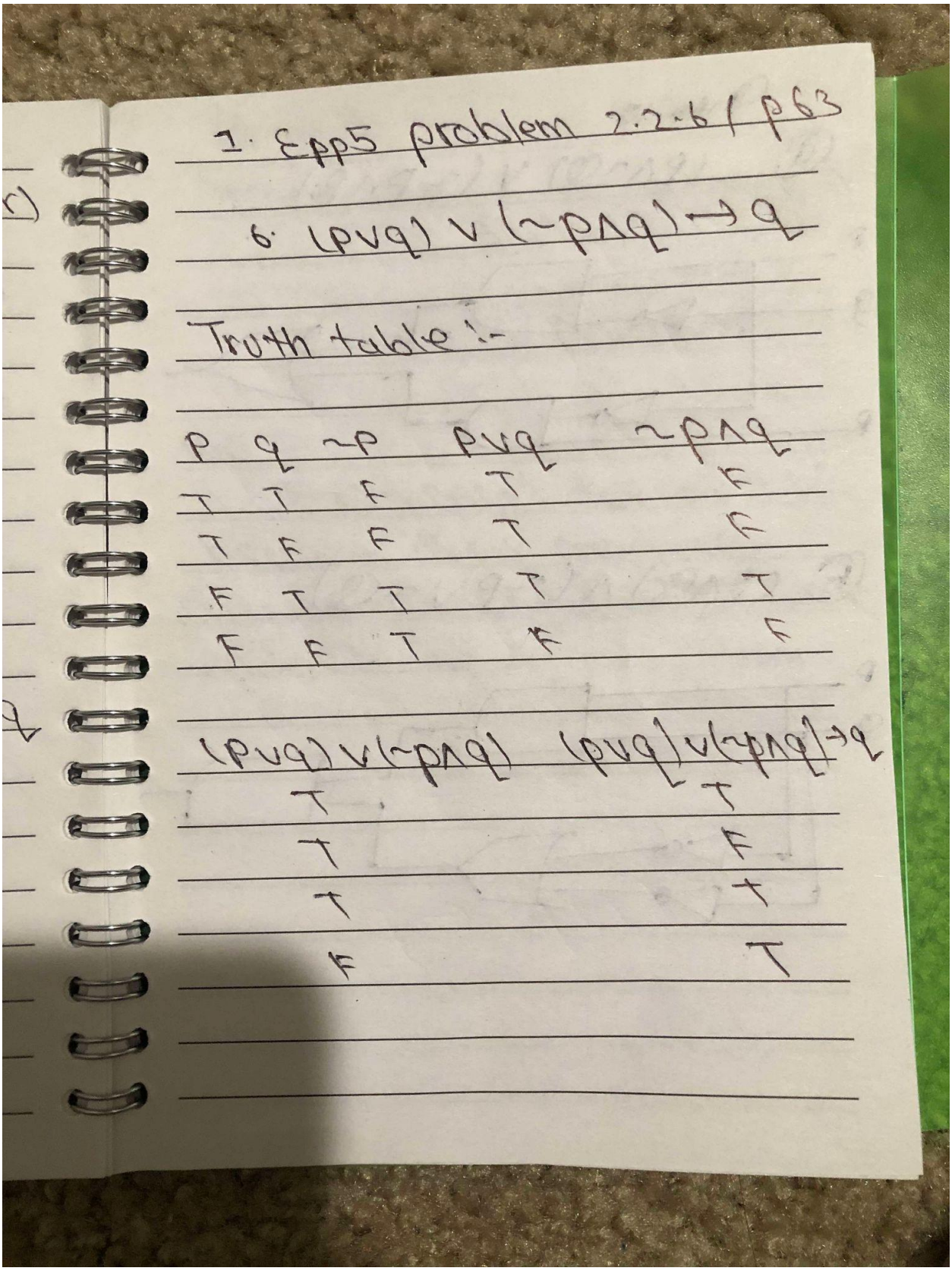
CS2200 F-24 Homework

Professor Tarek Seleem

25 September 2024

1. Epp5 problem 2.2.6 / p63.
2. Epp5 problem 2.2.14 / p63.
3. Epp5 problem 2.2.38 / p65.
4. Epp5 problem 2.2.43 / p65.
5. Epp5 problem 2.3.4 / p76.
6. Epp5 problem 2.3.10 / p77.
7. Epp5 problem 2.3.11 / p77.

8. Epp5 problem 2.3.23 / p77.



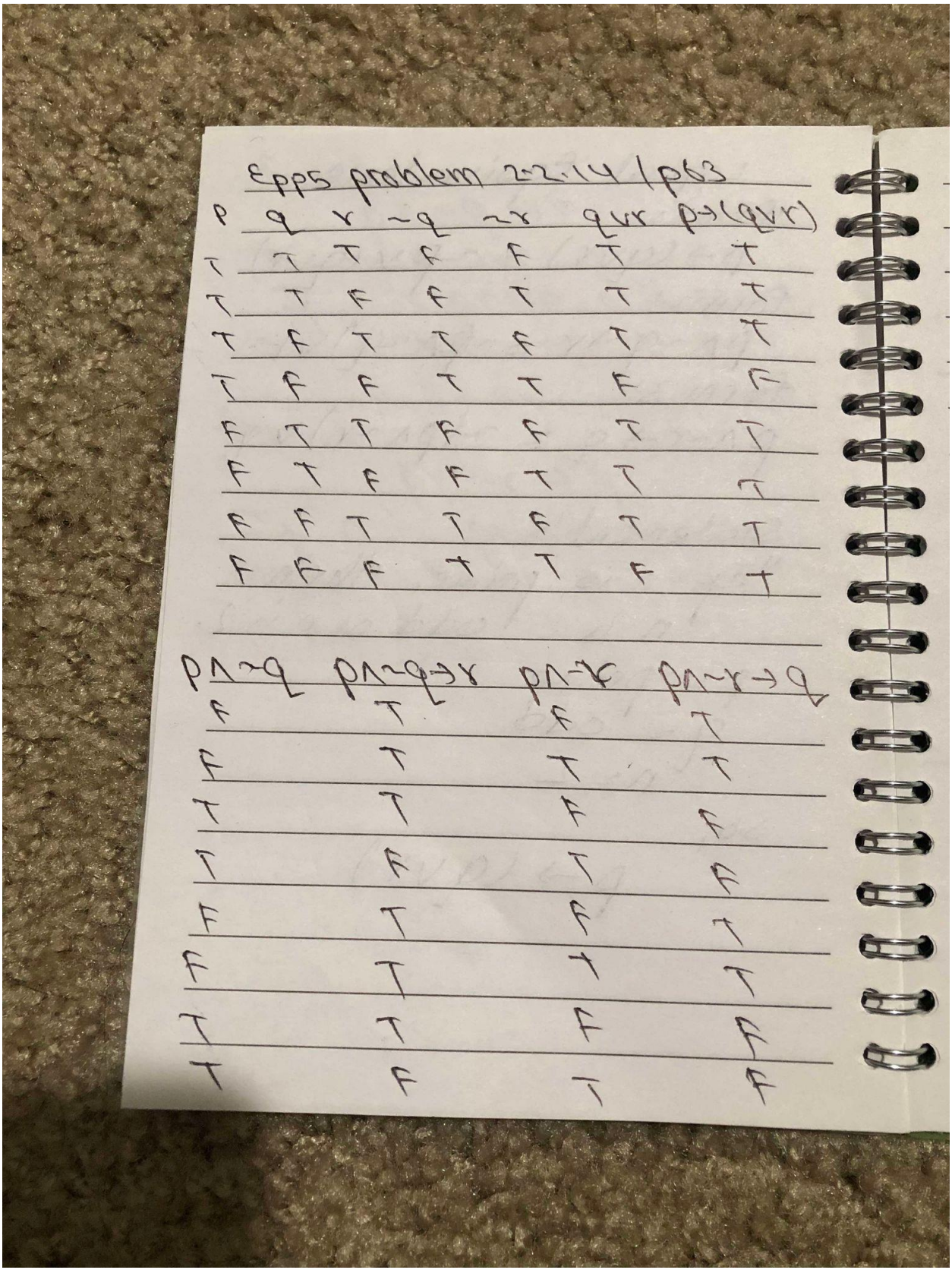
1. Epp5 problem 2.2.6 / p63

6. $(p \vee q) \vee (\sim p \wedge q) \rightarrow q$

Truth table :-

p	q	~p	p∨q	~p∧q
T	T	F	T	F
T	F	F	T	F
F	T	T	T	T
F	F	T	F	F

(p∨q)∨(~p∧q)	(p∨q)∨(~p∧q)→q
T	T
T	F
T	T
F	T


Epps problem 2.2.14 / p63

Logical Equivalence

form1:

$p \rightarrow (q \vee r) = \neg p \vee (q \vee r)$

form2:

$p \wedge \neg q \rightarrow r = \neg(p \wedge \neg q) \vee r$

form3:

$p \wedge \neg r \rightarrow q = \neg(p \wedge \neg r) \vee q$

statement:-

"If n is prime, then n is odd or n is 2.

p = prime

q = odd

n = 2

so,

$p \rightarrow (q \vee r)$

form 2:

$p \wedge \sim q \rightarrow r$

This read as:-

If n is prime n is not odd, then n is 2.

form 3:-

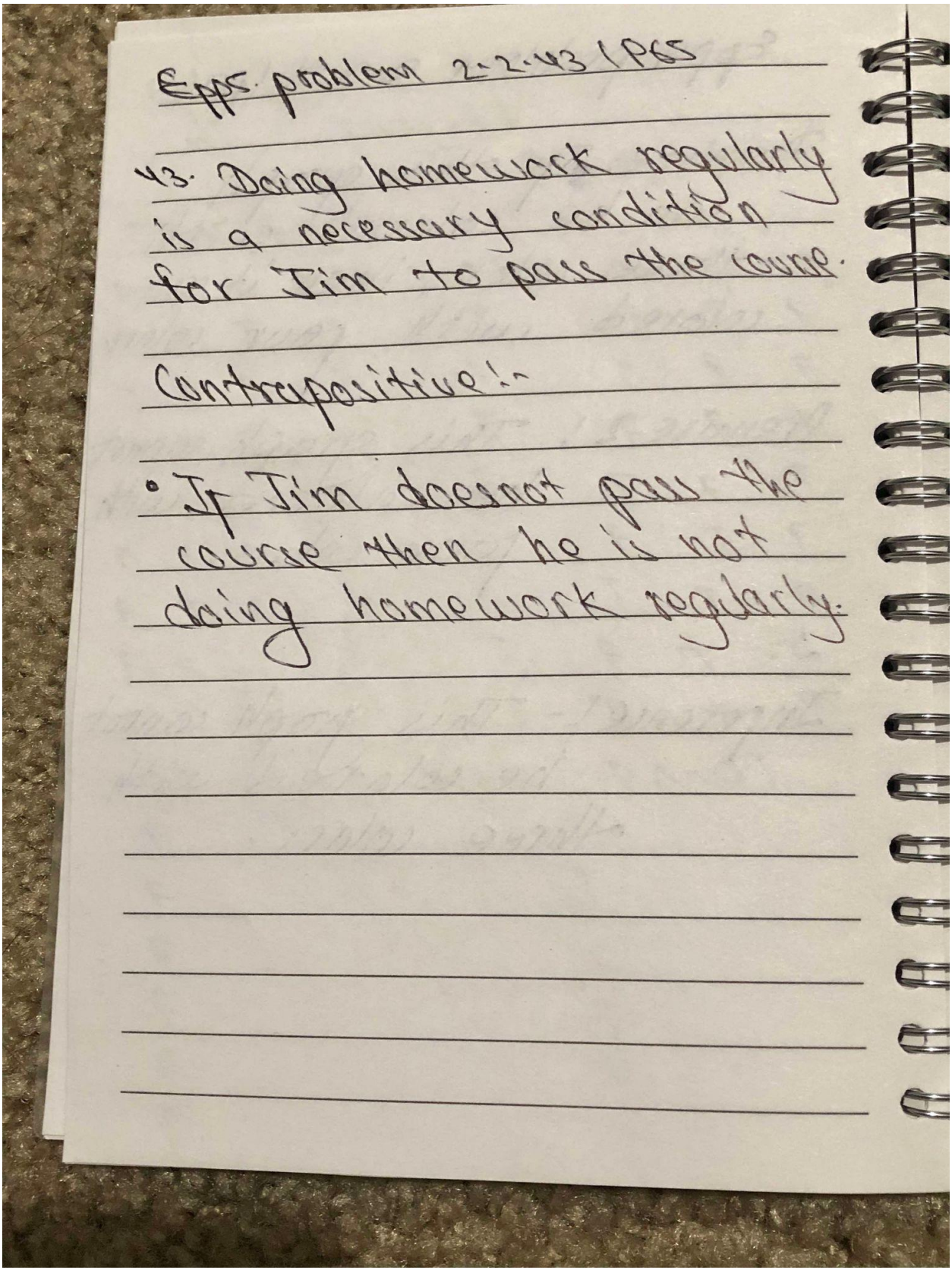
$p \wedge \sim r \rightarrow q$

If n is prime and n is not 2, then n is odd.

Q.3 Epp5 problem 2.2-38 pg 65

(38). Ann will go unless it rains.

∴ If it does not rain, then Ann will go.

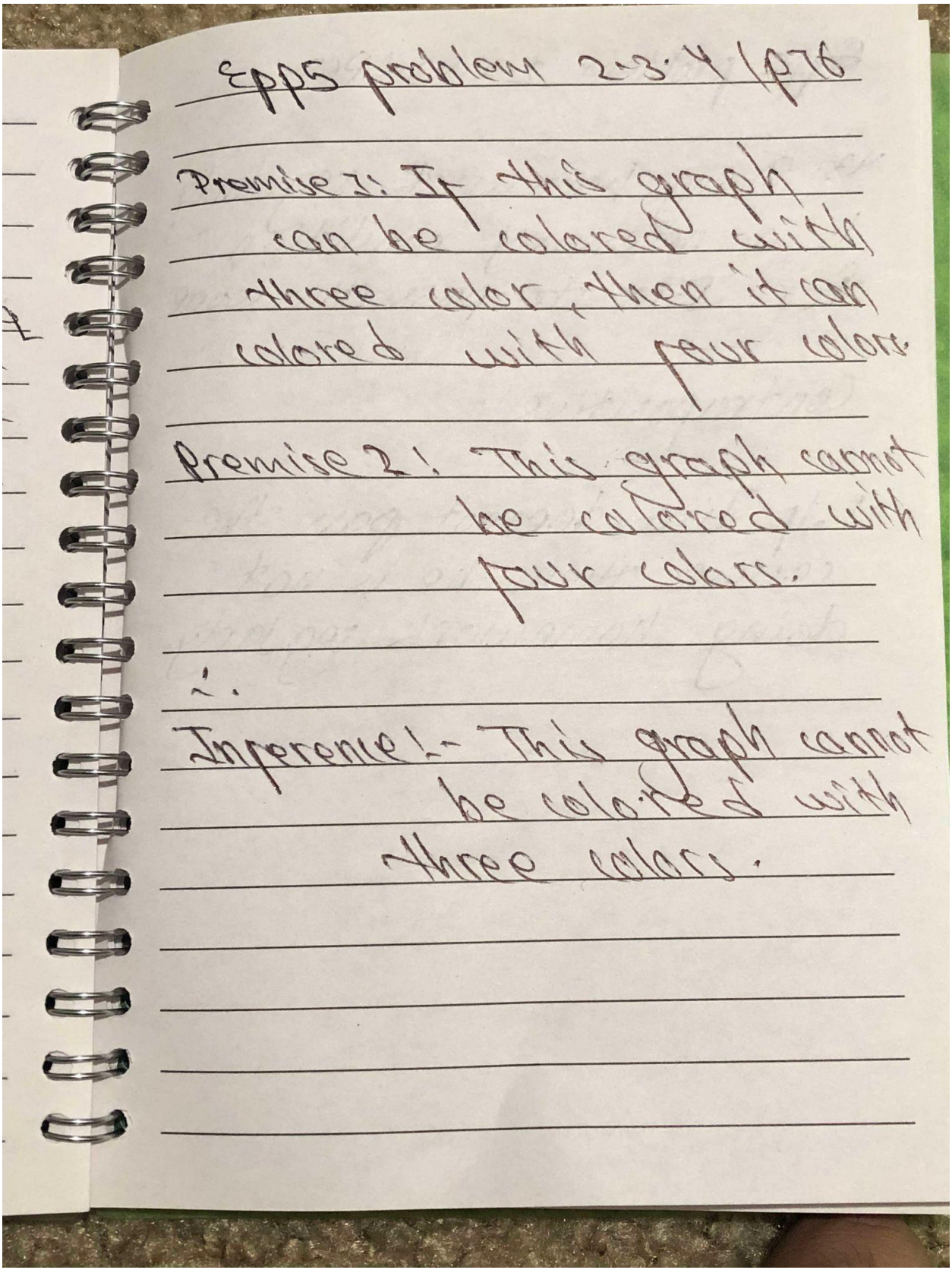


Epp. problem 2.2.43 | P65

43. Doing homework regularly is a necessary condition for Jim to pass the course.

Contrapositive :-

- If Jim doesnot pass the course then he is not doing homework regularly.



Epp5 problem 2.3.4 (p76

Premise 1: If this graph can be colored with three color, then it can colored with four colors.

Premise 2: This graph cannot be colored with four colors.

∴

Inference:- This graph cannot be colored with three colors.

Epp problem 2.3.10 (p77

10. $p \vee q \rightarrow r$

$\therefore \sim r \rightarrow \sim p \wedge \sim q$

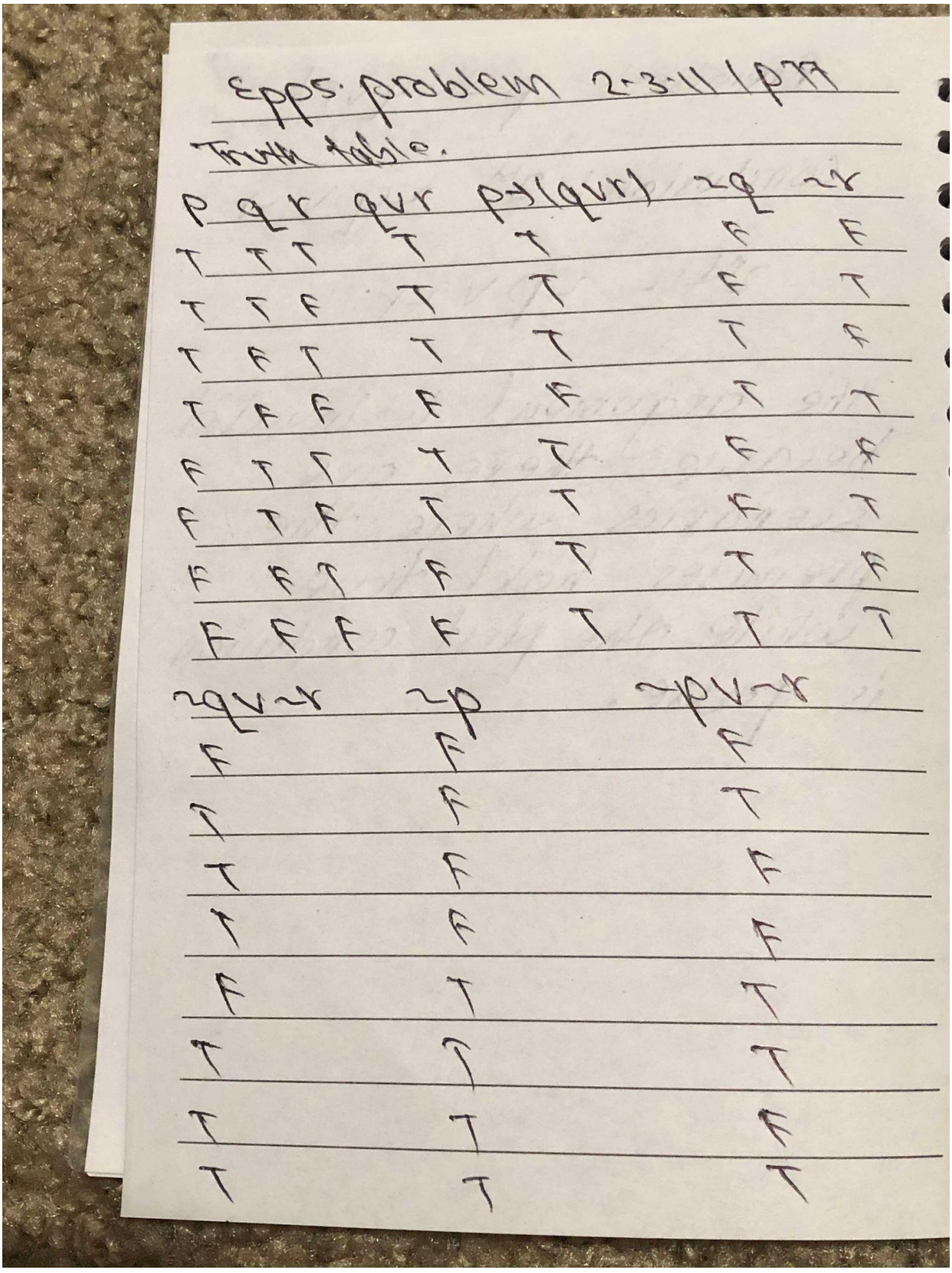
Truth table :-

p	q	r	$p \vee q$	$p \vee q \rightarrow r$	$\sim r$	$\sim p$	$\sim q$	$\sim p \wedge \sim q$	$\sim r \rightarrow (\sim p \wedge \sim q)$
T	T	T	T	T	F	F	F	F	T
T	T	F	T	F	T	F	F	F	F
T	F	T	T	T	F	F	T	F	T
T	F	F	T	F	T	F	T	F	F
F	T	T	T	T	F	T	F	F	T
F	T	F	T	F	T	T	F	F	F
F	F	T	F	T	F	T	T	T	T
F	F	F	F	T	T	T	T	T	T

Premise :- $P \vee Q \rightarrow R$

Conclusion :- $\neg R \rightarrow (\neg P \wedge \neg Q)$

The argument is invalid because there are cases where the premises are true but the conclusion is false.

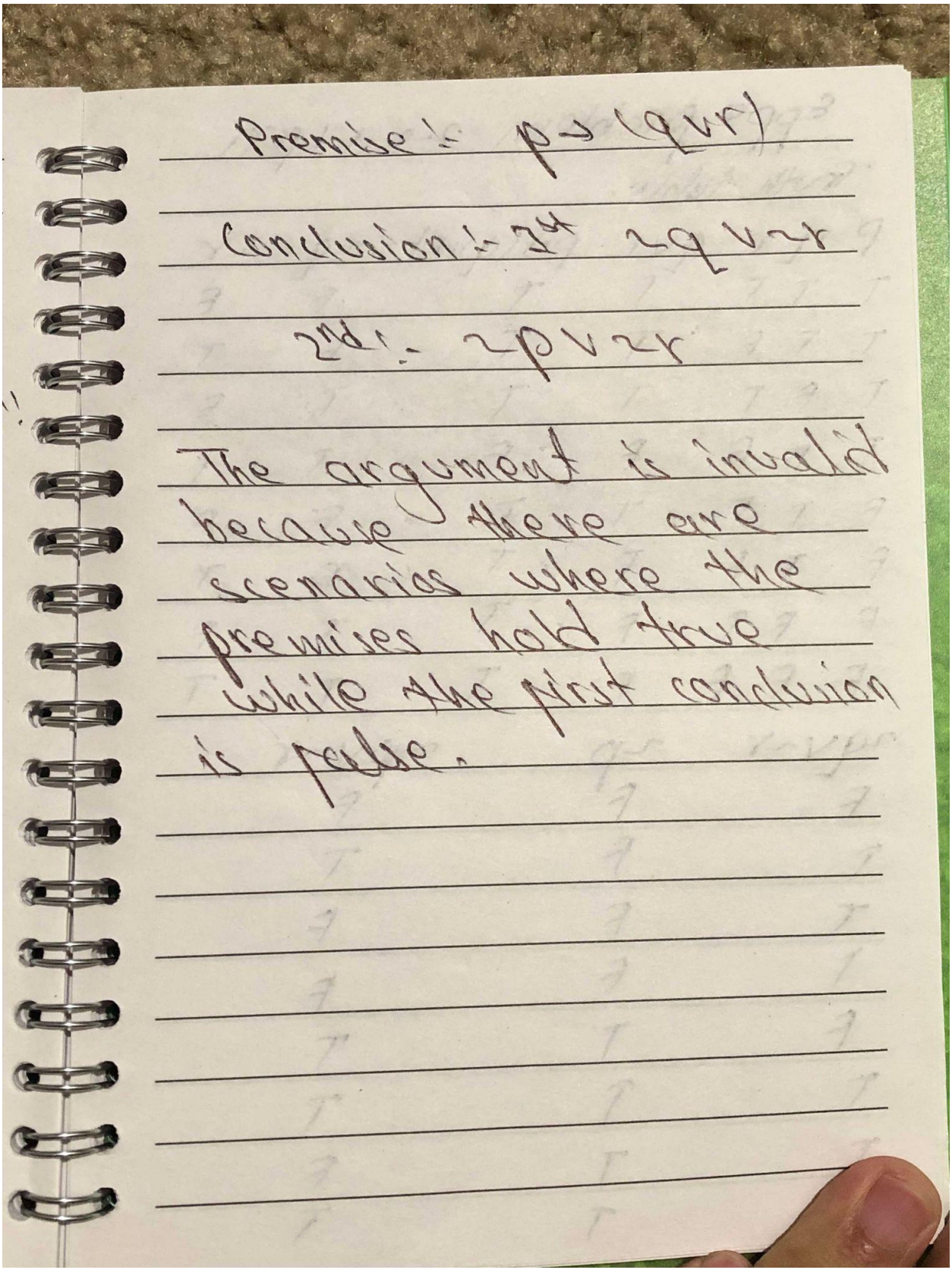


Epps. problem 2.3.11 | p77

Truth table.

p	q	r	q∨r	p→(q∨r)	¬q	¬r
T	T	T	T	T	F	F
T	T	F	T	T	F	T
T	F	T	T	T	T	F
T	F	F	F	F	T	T
F	T	T	T	T	F	F
F	T	F	T	T	F	T
F	F	T	T	T	T	F
F	F	F	F	T	T	T

¬q∨¬r	¬p	¬p∨¬r
F	F	F
T	F	T
T	F	F
T	F	F
T	T	T
T	T	T
T	T	F
T	T	T



Premise :- $p \vee (q \vee r)$

Conclusion :- $\exists x \; 2q \vee 2r$

$\forall x :- 2p \vee 2r$

The argument is invalid because there are scenarios where the premises hold true while the first conclusion is false.

Epp5 problem 2.3.23 /p77

Q.no-23.

Soln,

Let,

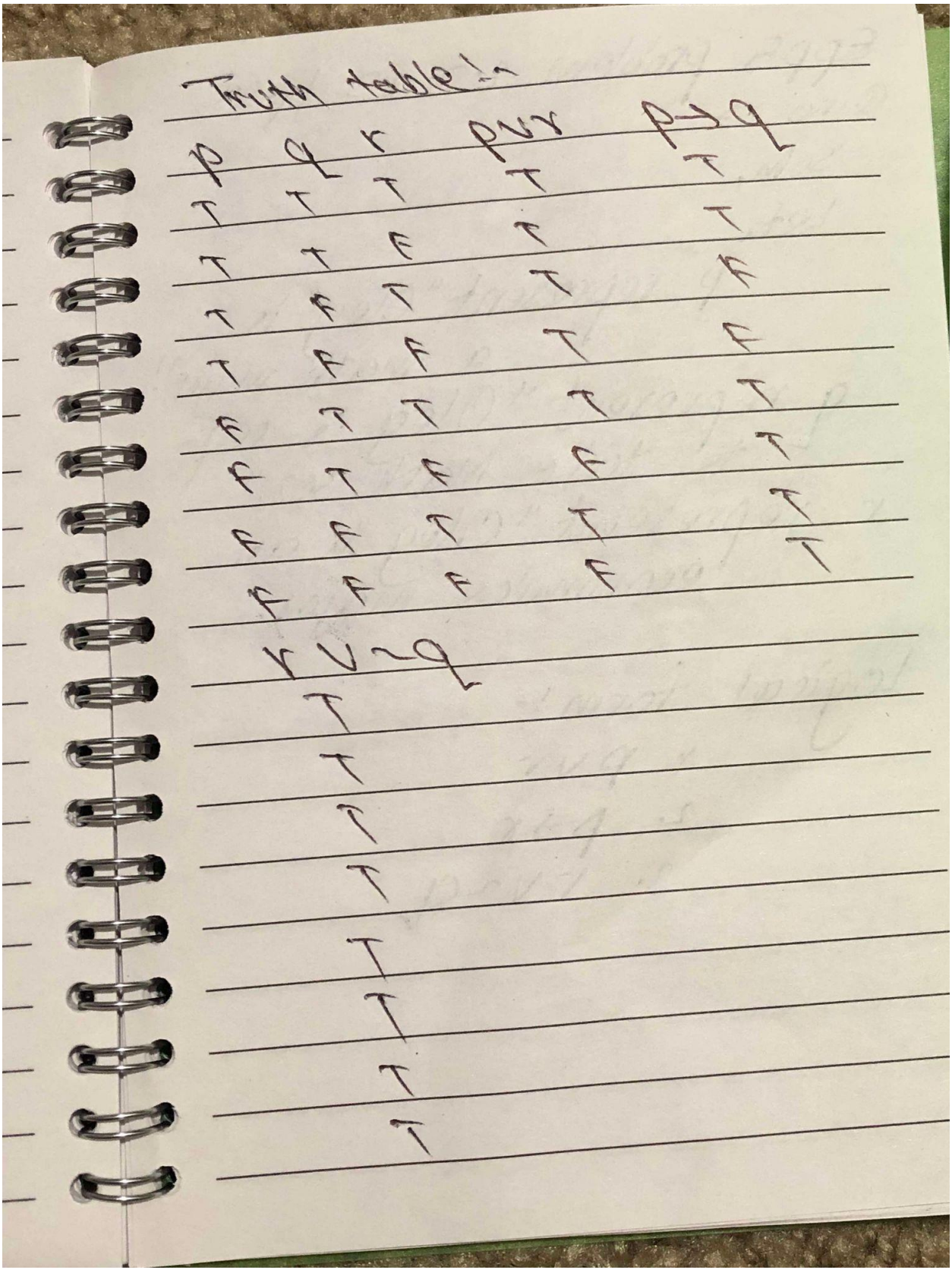
p represent "Oleg is a math major".

q represent "Oleg is req- to take MATH 362."

r represent "Oleg is an economics major.

Logical form :-

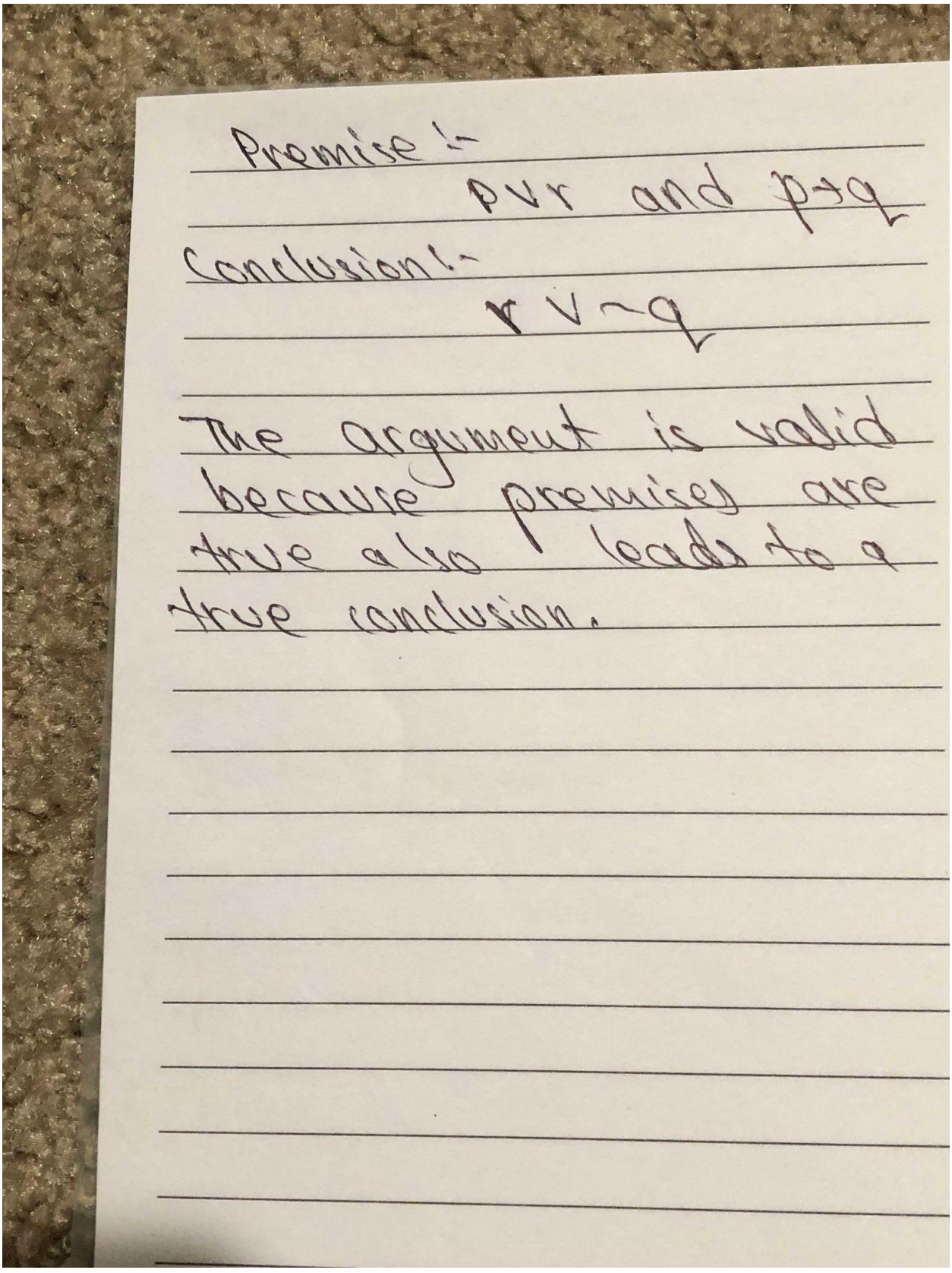
1. $p \vee r$
2. $p \rightarrow r$
3. $r \vee \sim q$



Truth table :-

p	q	r	p∨r	p→q
T	T	T	T	T
T	T	F	T	T
T	F	T	T	F
T	F	F	T	F
F	T	T	T	T
F	T	F	F	T
F	F	T	T	T
F	F	F	F	T

r ∨ ~q
T
T
T
T
T
T
T
T



Premise :-

p v r and p → q

Conclusion :-

r v ~q

The argument is valid because premises are true also leads to a true conclusion.