

$$P_1: P \rightarrow r$$

$$P_2: \neg q \rightarrow P$$

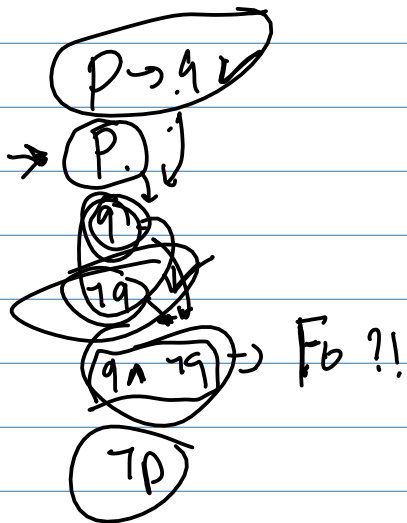
$$P_3: \neg r$$

← Argument

$$(P_1 \wedge P_2 \wedge P_3) \rightarrow ?$$

$$\downarrow$$

P	q	r	$P_1: P \rightarrow r$	$P_2: \neg q \rightarrow P$	$\neg r$	$P_1 \wedge P_2 \wedge P_3$
0	0	0	1	0	1	0
0	0	1	1	0	0	0
0	1	0	1	1	1	1
0	1	1	1	1	0	0
1	0	0	0	1	1	0
1	0	1	1	1	0	0
1	1	0	0	1	1	0
1	1	1	1	1	0	0



$$\neg(r \wedge s) \equiv \neg r \vee \neg s$$

p q r s t

$$P_1: (\neg p \vee \neg q) \rightarrow (r \wedge s)$$

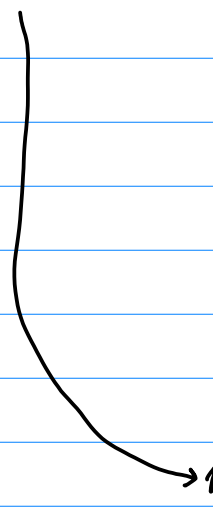
$$P_2: r \rightarrow t$$

$$\frac{P_3: \neg t}{C: \therefore P}$$

Proof
Statement

Justification
for why
the statement

- | | | |
|-----|---|-------------------------|
| 1. | $(\neg p \vee \neg q) \rightarrow (r \wedge s)$ | Premise |
| 2. | $r \rightarrow t$ | Premise |
| 3. | $\neg t$ | Premise |
| 4. | $\neg r$ | MT, lines 2, 3 |
| 5. | $\neg r \vee \neg s$ | R.D.A, line 4 |
| 6. | $\neg(r \wedge s)$ | DeMorgan's Rule, line 5 |
| 7. | $\neg(\neg p \vee \neg q)$ | MT, lines 1, 6 |
| 8. | $\neg\neg p \wedge \neg\neg q$ | DeMorgan's Rule line 7 |
| 9. | $p \wedge q$ | Double Negation line 8 |
| 10. | P | R. Conj. Simp line 9 |



$$\neg p \leftrightarrow q$$

$$q \rightarrow r$$

$$\frac{\neg r}{\therefore p}$$

Proof	Reason
Stm A	
1. $\neg p \rightarrow q$	Premise
2. $q \rightarrow \neg p$	Premise
3. $q \rightarrow r$	Premise
4. $\neg r$	Premise
5. $\neg q$	MT St. 3, 4
6. $\neg \neg p$	MT St. 1, 5
7. p	Double neg st

Stm A	Reason
1. $\neg p \rightarrow q$	Premise
2. $q \rightarrow \neg p$	Premise
3. $q \rightarrow r$	Premise
4. $\neg r$	Premise
5. $\neg p$	Assumption
6. q	MP 1, 5
7. r	MP 3, 6
8. $r \wedge \neg r = F_0 \rightarrow$	R.O.C. 4.7
9. p	Pr. by Contr. Lines 5-8

$\sqrt{2}$ is irr.

α $\sqrt{2} = \frac{a}{b}$ $\gcd(a, b) = 1$

$a = \sqrt{2}b$

$a^2 = 2b^2$

$2 \mid a^2 \Rightarrow 2 \mid a$

$a = 2k$

$b = 2m$

F_0

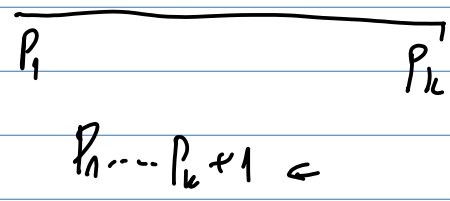


~~48~~
~~3+45~~ p.c
~~5+43~~ (PP)
~~7+41~~ PP
~~9+39~~ p.c
 \vdots

$\forall x$ for all
 $\forall x$ where $x \in \text{odd int.}$
 x^2 is an odd int.

$\forall x \in \mathbb{O} : x^2 \in \mathbb{O}$

The set of prime numbers is infinite.



\exists there exists
 (for some)
 $\exists x \in \mathbb{Z} : x^2 = 0$
 $x = 0$

Goldbach Conj
 $\forall x \in \text{Even int} > 2$
 $\exists p, q \in \text{Prime}$
 such that $x = p + q$
 $24 = 11 + 13$
 $48 = 41 + 7$

~~False~~
 $\exists n \in E : n^2 \text{ is odd.}$
 $\rightarrow n = 2k \rightarrow n^2 = 4k^2 \in E$

$\forall x \in E \quad x^2 > 1$

$x = 0 \Rightarrow \text{Counter example}$