Engr 123

L6
Arguments
Proofs

A2 Q5, Base 2

10

×11

10
+100
110

1×2+0×1

1×2+1×1

Uniqueness
Base 10

27

×35

135
+810
945

Q4 d, e

(d) combine A, B, C

(e) possible sol^n's

From yesterday

Fred is a fish

All fish swim in the ocean

Fred swims in the ocean

Fish(x) = "x is a fish"

Swim(y) = "y swims in the ocean

} p.c.t

Fish(Fred)

$\forall y (Fish(y) \rightarrow Swim(y))$

Swim(Fred)

Valid

Fish(Fred)

$\forall y (Swim(y) \rightarrow Fish(y))$

Swim(Fred)

Invalid

Skip to pg 4

Uniqueness

Existential quantifier $\exists$

$\exists x\, P(x)$

there is at least one x satisfying P

---

want to say, there exists a unique x satisfying P

$$\exists x \Big(P(x) \wedge \forall y \big[P(y) \to y = x \big] \Big)$$

$$\exists x \big(P(x) \wedge \neg \exists y [P(y) \wedge y \neq x] \big)$$

Fish(Fred) (i)

$\forall y [\neg Swim(y) \rightarrow \neg Fish(y)]$ (ii)

Swim(Fred) Valid

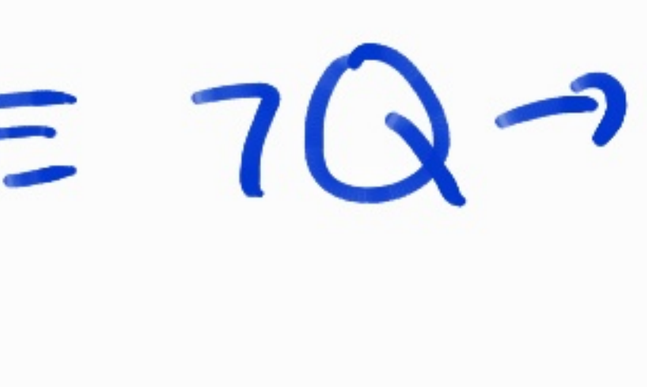
(ii) $\equiv \forall y [Fish(y) \rightarrow Swim(y)]$

$P \rightarrow Q \equiv \neg Q \rightarrow \neg P$

$[(P \rightarrow Q) \wedge (Q \rightarrow R)] \rightarrow [P \rightarrow R] \equiv T$

is a tautology

$$\frac{P \rightarrow Q \quad Q \rightarrow R}{P \rightarrow R}$$ transitivity



$$\frac{P \quad P \rightarrow R}{R}$$ modus ponens

$$\frac{P \qquad \neg R \to \neg P}{R}$$

Modus tollens

Number theory ($\mathbb{Z}$)

Divisibility

---

n is even iff $\exists k \in \mathbb{Z}\,(n = 2k)$