（科目：离散六） 数 学 作 业 纸

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1.(3) $(\forall x)(P(x)\vee q)\to(\exists x)(P(x)\wedge q)$

$=\neg(\forall x)(P(x)\vee q)\vee(\exists x)(P(x)\wedge q)$

$=(\exists x)(\neg P(x)\wedge\neg q)\vee(\exists x)(P(x)\wedge q)$

1.(8) $(\exists x)P(x)\wedge(\forall x)Q(x)\to(\exists x)(P(x)\wedge Q(x))$

$=\neg((\exists x)P(x)\wedge(\forall x)Q(x))\vee(\exists x)(P(x)\wedge Q(x))$

$=((\forall x)\neg P(x)\vee(\exists x)\neg Q(x))\vee(\exists x)(P(x)\wedge Q(x))$

$=(\forall x)\neg P(x)\vee(\exists x)(\neg Q(x)\vee(P(x)\wedge Q(x))$

$=(\forall x)\neg P(x)\vee(\exists x)((\neg Q(x)\vee P(x))\wedge(\neg Q(x)\vee Q(x)))$

$=(\forall x)\neg P(x)\vee(\exists x)(\neg Q(x)\vee P(x))$

$=(\forall x)\neg P(x)\vee\exists(x)\neg Q(x)\vee\exists(x)P(x)$

$=\neg(\exists x)P(x)\vee\exists(x)P(x)\vee\exists(x)\neg Q(x)$

$=T$

故 $(\exists x)P(x)\wedge(\forall x)Q(x)\Rightarrow(\exists x)(P(x)\wedge Q(x))$

$(\exists x)P(x)\wedge(\forall x)Q(x)$ (?)

$=(\exists x)P(x)\wedge(\forall y)Q(y)$

$=(\exists x)(P(x)\wedge(\forall y)Q(y))\Rightarrow(\exists x)(P(x)\wedge Q(x))$

1(9) 原式 $=(\forall x)P(x)\wedge(\forall x)Q(x)\wedge\exists(x)R(x)\vee((\forall x)P(x)\wedge(\forall x)Q(x)\wedge(\exists x)S(x))$

$=(\forall(x)(P(x)\wedge Q(x))\wedge(\exists x)R(x))\vee(\forall x)(P(x)\wedge Q(x))\wedge(\exists x)S(x))$

$=(\forall x)(P(x)\wedge Q(x))\wedge((\exists x)R(x)\vee(\exists x)S(x))$

$=(\forall x)(P(x)\wedge Q(x))\wedge(\exists x)(R(x)\vee S(x))$

2.(4) 不普遍有效.

在 $\{1,2\}$ 域上，令 $P(1)=Q(1)=F$. $P(2)=Q(2)=T$

~~该式可满足~~ 该式为否

$(\exists x)P(x)\to(\forall x)Q(x)$

$=P(1)\vee P(2)\to Q(1)\wedge Q(2)=1\to 0=0$

(3) 普遍有效：原式 $=$

$\neg((\forall x)\neg P(x)\vee(\forall x)Q(x))\vee(\forall x)(\neg P(x)\vee Q(x))$

$=((\exists x)P(x)\wedge(\exists x)\neg Q(x))\vee(\forall x)(\neg P(x)\vee Q(x))$

$(\forall(x)\neg P(x)\vee(\forall x)Q(x))\to(\forall x)(\neg P(x)\vee Q(x))$

前件为T时，$(\forall x)\neg P(x)$ 为T，则后件为T

$(\forall x)Q(x)$ 为T时，后件也为T.

$(\forall x)Q(x)\wedge(\forall x)\neg P(x)$ 为T，则后件也为T.

故普遍有效

(6). 显然不普遍有效

在 $\{1,2\}$ 上，$P(1)=Q(2)=F$. $P(2)=Q(1)=T$.

该式为假