

CS 4860 Lecture 20

Examples - "true" propositions

$$1. \exists x \forall y. P(x, y) \Rightarrow \forall x \exists y. P(x, y)$$

$$2. \exists x. P(x, x) \Rightarrow \exists x. \exists y. P(x, y)$$

$$3. \forall x. \forall y. P(x, y) \Rightarrow \forall x. P(x, x)$$

$$4. (\forall x. P(x) \vee \forall x. Q(x)) \Rightarrow \forall x. (P(x) \vee Q(x))$$

$$5. \exists x. (P(x) \wedge Q(x)) \Rightarrow \exists x. P(x) \wedge \exists x. Q(x)$$

$$6. (\exists x. P(x) \Rightarrow \forall x. Q(x)) \Rightarrow \forall x. (P(x) \vee Q(x))$$

What about these propositions? Are any true?

$$(a) \forall x, y. (P(x, y) \Rightarrow P(y, x))$$

$$(b) \exists x. \exists y. (P(x, y)) \Rightarrow (\exists x. P(x, x))$$

$$(c) \forall x. Q(x, x) \Rightarrow \forall x. \forall y. Q(x, y)$$

$$(d) \forall x. (P(x) \vee Q(x)) \Rightarrow (\forall x. P(x) \vee \forall x. Q(x))$$

$$(e) (\exists x. P(x) \wedge \exists x. Q(x)) \Rightarrow \exists x. (P(x) \wedge Q(x))$$