



domain: people

$P(x,y)$ :  $x$  is  $y$ 's parent

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

- Everyone has a parent

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

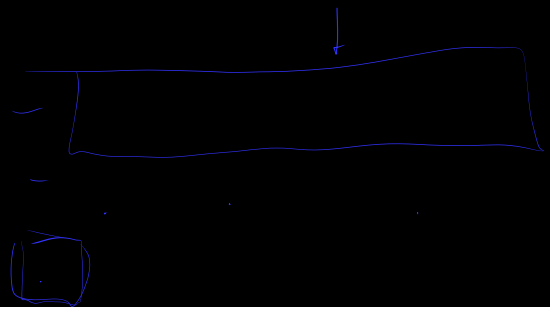
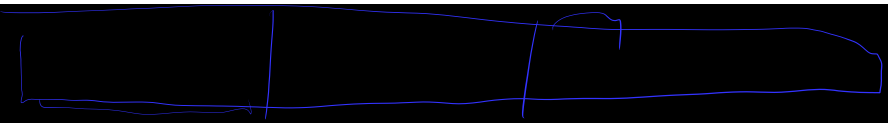
- There is a universal parent,  
a parent we all share

$$\forall b \in \text{Boys}. P(b)$$

$$\boxed{\exists y. \forall x. P(y,x) \stackrel{\text{entails}}{=} \forall x. \exists y. P(y,x)}$$

$$\text{domain is non-empty, } \forall x. P(x) \stackrel{\text{entails}}{=} \exists x. P(x)$$

$$S \neq \{\} \wedge \forall x \in S. P(x) \stackrel{\text{entails}}{=} \exists x \in S. P(x)$$



$$\forall x. G(x) \rightarrow \neg F(x)$$

$$\wedge H(x)$$

$$\exists x. \neg H(x)$$

$$\neg \exists x. \neg H(x)$$

$$\forall x. \neg \neg H(x)$$

People = {t, y, r}

$$H(t) \wedge H(y) \wedge H(r)$$

$$(C(t) \rightarrow H(t)) \wedge (C(y) \rightarrow H(y)) \wedge (C(r) \rightarrow H(r))$$

$$(C(t) \wedge H(t)) \vee (C(y) \wedge H(y)) \vee (C(r) \wedge H(r))$$

$$\exists x. \neg \underbrace{P(x)} \vee \underbrace{Q(x)} \quad \checkmark$$

$$\exists x. \underbrace{P(x)} \rightarrow \underbrace{Q(x)} \quad \checkmark$$

$$\forall x. P(x) \wedge Q(x) \quad \checkmark$$

