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CIS 521

HW 5

- 1.
- $\exists s \forall x (Failed(x, Econ) \leftrightarrow s = x)$
 - $\exists s \forall x ((Failed(x, Econ) \wedge Failed(x, Psych)) \leftrightarrow s = x)$
 - $\forall s_1 \forall s_2 (Best(s_1, Mathematics) \wedge Best(s_2, Psychology) \wedge Better(s_1, s_2))$
 - $\forall p (\forall v Dislikes(p, v) \wedge \neg Vegetarian(v) \rightarrow Smart(p))$
 - $\exists w (\forall m \neg Vegetarian(m) \rightarrow Likes(w, m))$
 - $\exists b \forall m \neg Shaves(m, m) \rightarrow Shaves(b, m)$
 - $\forall m ((\exists p \forall t Loved(p, t) \wedge \neg \forall p \forall t \neg Loved(p, t)) \wedge (\exists t \forall p Loved(p, t)))$

2. $m = me$; $f = my father$; $t = that man$; $tf = that man's$

- $\forall x, y (Brother(x, y) \vee Sister(x, y) \rightarrow sibling(x, y))$ father
 - $\forall x, y (Father(x, y) \leftrightarrow Son(y, x))$
 - $\forall b, s (\neg Brother(m, b) \vee \neg Sister(m, s))$ "Brothers and sisters I have none"
 - $Father(f, m)$
 - $Father(tf, t)$
 - $Son(tf, f)$ "That man's father is my father's son"
 - $\forall x, y, f, s (Son(x, f) \wedge Son(y, f) \wedge \neg Sibling(x, s)) \rightarrow x = y$
-
- $\forall s \neg Sibling(m, s)$
 - $Son(m, f)$
 - $m = tf$
- and (c)
 - and (d)
 - and (f) and (h) and (g)

So, I am that man's father

$$p \rightarrow q \equiv \neg p \vee q$$

$$p \leftrightarrow q \equiv (\neg p \vee q) \wedge (p \vee \neg q)$$

3. a) ~~a)~~ $\forall x ((\neg \forall y \neg \text{Eats}(x, y) \vee \text{FastFood}(y)) \vee (\exists y \text{HasHealthProbs}(x, y)))$
 $\forall x (\exists y \text{Eats}(x, y) \wedge \neg \text{FastFood}(y)) \vee \exists z \text{HasHealthProbs}(x, z)$
 $\forall x (\text{Eats}(x, F(x)) \wedge \neg \text{FastFood}(F(x)) \vee \text{HasHealthProbs}(x, G(x)))$
 $((\text{HHP}(x, F(x)) \vee \text{Eats}(x, F(x))) \wedge (\text{HHP}(x, G(x)) \vee \neg \text{FF}(F(x))))$

~~b)~~ $\forall x (\neg \exists y \text{HHP}(x, y)) \vee \text{HC}(x) \vee \text{HBS}(x)$
 $\neg \text{HHP}(x, y) \vee \text{HC}(x) \vee \text{HBS}(x)$

~~c)~~ $\forall x \text{Drinks}(\text{okc}(x) \vee \neg \text{HighBloodSugar}(x))$

~~d)~~ $\forall x \neg ((\text{HC}(x) \wedge \neg \text{WO}(x)) \vee \text{SL}(x))$
 $\neg \text{HC}(x) \vee \text{WO}(x) \vee \neg \text{SL}(x)$

~~e)~~ $\forall x \neg (\text{Lazy}(x) \wedge \text{WO}(x))$
 $\neg \text{Lazy}(x) \vee \neg \text{WO}(x)$

~~f)~~ $\neg \text{Eats}(\text{Donald}, x) \vee \text{FF}(x)$

~~g)~~ $\neg \text{Drinks}(\text{oke}(\text{Donald}))$

~~h)~~ $\text{Lazy}(\text{Donald})$

$$\begin{aligned} & \neg x \wedge ((x \vee y) \wedge (x \vee z)) \\ & \equiv (\neg x \wedge (x \vee y)) \wedge (\neg x \wedge (x \vee z)) \\ & \equiv (\neg x \vee y) \wedge (\neg x \vee z) \\ & \equiv y \vee z \end{aligned}$$

b) i) $\neg \text{SL}(\text{Donald})$

j) $\neg \text{HC}(\text{Donald}) \vee \text{WO}(\text{Donald})$

k) $\neg \text{HC}(\text{Donald}) \vee \neg \text{Lazy}(\text{Donald})$

l) $\neg \text{HC}(\text{Donald})$

m) $\neg \text{HHP}(\text{Donald}, y) \vee \text{HBS}(\text{Donald})$

n) $\neg \text{HHP}(\text{Donald}, y) \vee \text{Drinks}(\text{oke}(\text{Donald}))$

o) $\neg \text{HHP}(\text{Donald}, y)$

p) $\text{Eats}(\text{Donald}, x) \vee \neg \text{FF}(x)$

q) —

negated goal:

i) and d) $x \neq \text{Donald}$

j) and e) $x \neq \text{Donald}$

k) and h)

e) and b)

m) and c)

n) and g)

o) and a)

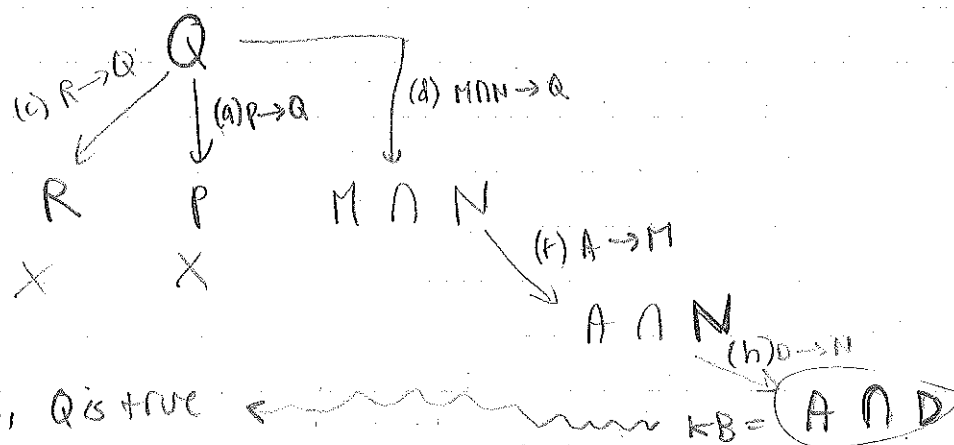
p) and f) ✓

4. New True value Statements used True values

	A, B, C	(a) and (b) and (c)	A, B, C
(i)	E	(a) and (c) and (h)	A, B, C, E
(j)	H	(i) and (a)	A, B, C, E, H

∴ Yes, H is True

5.



∴ Yes, Q is true

6. $\log(63200) = 4.8$

↓ by (c)

$$\log(632 \times 100) = 4.8$$

↓ by (f)

$$\log(632) + \log(100) = 4.8$$

↓ by (b)

$$2.8 + \log(100) = 4.8$$

↓ by (a)

$$2.8 + 2 = 4.8$$

↓ by (d)

$$4.8 = 4.8 \Rightarrow T \Rightarrow \therefore \log(63200) = 4.8$$

