mid-term test

3. Translate the following sentences into propositional logic or predicate logic (15

a. Tom can access the Gate only if he is a student or he is not a graduate.

b. Every integer has an inverse.

4. Translate the statement into English sentences (15):

a. $\forall x (\exists y (C(y) \wedge F(x, y)) \vee C(x))$

where C(y) is "y has a math book," and F(x,y) is "x and y are friends," and the domain for both x and y consists of all students in our class.

b. $\exists s \forall b \exists e (P(s,e) \wedge Q(e,b))$

where P(s,e) be "s has understand e ", Q(e,b) be "e is an equation in book b" and the domain of s is all student, the domain of e is all equations, and the domain of b is all math books.

Put $P \wedge Q \vee R$ into PCNF and PDNF (20分)

About set: (20)

Cardinality? s1=: {3, {1,2,3,4}, {}, ∅, {{}}}, s2=:{x| x is non-negative integer, $x < 4$}

$\forall x (x \in A \rightarrow x \in B) \wedge \exists x (x \in B \wedge x \in A) \Leftrightarrow ? \Leftrightarrow ? \Leftrightarrow ?$ (three equivalent forms)

5. a. $h \circ f \circ g(x) = ?$, $f(x) = 3x + 5$, $g(x) = x^2 - 1$, $h = 2x$ (10)

b. prove: if f, g are bijective then f∘g is bijective. (20)

1. a: P: Tom can access the Gate

Q: Tom is a student

R: Tom is a graduate

$P \rightarrow (Q \wedge \neg R)$

b:

$\forall x \exists y (xy = 0)$

the domain of x, y is integer.

2. a: Every students in our class has a math book or has a friend who have a math book.

b: There is a student who understand at least one equation in every math book.

3. PCNF

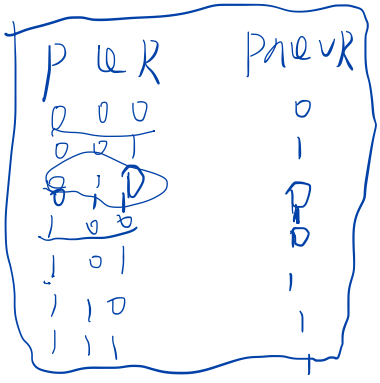
$(P \wedge Q) \vee R$

$\equiv (P \vee R) \wedge (Q \vee R) \equiv (P \vee R \vee Q) \wedge (P \vee \neg R \vee R) \wedge (Q \vee R \vee P) \wedge (Q \vee R \vee \neg P)$

$\equiv (P \vee Q \vee R) \wedge (P \vee \neg Q \vee R) \wedge (\neg P \vee Q \vee R)$

$\equiv \Pi(0, 1, 4)$

$PDNF \equiv \Sigma(2, 3, 5, 6, 7)$



4. $\alpha: S_1 = 4$

$S_2 = 5$

$b :\Leftrightarrow \forall x (x \notin A \vee x \in B) \wedge \exists x (x \in B \wedge x \notin A)$

$\Leftrightarrow A \subseteq B \wedge \exists x (x \in B \wedge x \notin A)$

$\Leftrightarrow A \subseteq B \wedge \neg \forall x (x \notin B \vee x \in A)$

$\Leftrightarrow A \subset B$

5. $2x(3 \mid x^2 - 1) + 5)$