SW Formal Specification #2
FOL (First Order Logic)

Logically Constant —> True / False

∧ - And
∨ - OR
==> Imply
<==> Equivalent
! —> Not

Ax - Universal Operator (All of)
Ex - Existential Operator (Some of)

Sheet 1

Question1) Transform These English Sentence Into FOL

a) All Kids Like to Play
   Ak (likestoPlay (K))
b) Elements in an Array is Arranged in Descending Order Where Size is the Size of the array
   Ai Aj (0<= i< J < Size—> Arr[i] > Arr [j])
c) Every Gardner Likes the Sun
   Ag [gardner(g)—> like (g , Sun)]
d) You can fool some of the people all of the time
   Ep At (YoucanFool (p,t))
e) You can fool All of the People some of the time
   Ap Et (YouCanFool (p,t))
f) The Elements of an Integer array called Arr , Which has size (s) , are in ascending
   Ai Aj (0<=I <= J< s —> Arr[i] < Arr [J])
g) An Integer X is Only Found Once in an array of size S
   Ai Aj (0 <= i <=J < S , Arr[I]= X ∧ Arry[J]=X —> I=J)
h) Some people hate any kind of Exam
   Ep Ae (Hate [p,e])
i) For Each Exam , There is someone Who hates it
   Ae Ep (Hate [p,e])

Question 2)
A) Ax (Mushroom (x) ∧ purple (X) —> Poisonous (X))
All Purple Mushrooms are Poisonous
B) Ax (Mushroom (X)∧ Purple (X)—> ! Poisonoous (X))
All Purple Mushrooms are not Poisonous
C) ! Tall (Clinton)
Clinton is not Tall
D) Ai (0 < i < Size —> Arr [i]< Arr [0]) , Where size is the array size
Arr[0] is The Largest Element in the Array

$\forall x\ \forall y\ \ even(x) \wedge even(y) \rightarrow\ even(x+y)$ (1)
$\forall x\ \forall y\ \ odd(x) \wedge odd(y) \rightarrow\ even(x+y)$ (2)
$\forall x\ even(x) \rightarrow\ even(square(x))$ (3)
$\forall x\ odd(x) \rightarrow\ odd(square(x))$ (4)
$\forall x\ prime(x) \rightarrow \neg prime(square(x))$ (5)

1) For all Values of X & Y That are Even Implies that Sum of X & Y Are Even
2) For all Values of X & Y That are Odd Implies that Sum of X & Y Are Even
3) For all Values of X That are Even Their Square Are also Even
4) For all Values of Y That are Odd Their Square Are also Odd
5) For All Values of X that are Prime Their Squares are not Prime

1) Prove even (6)
   Rule 2 is Correct odd(3)+ odd (3)—> even (6)
   Rule 1 is Correct even(4) + even (2) —> Even (6)
2) Odd (3)

   Odd (X)—> odd (x+3)
   Odd (3) —> Odd (9)

Question 4) Do the two statements X→Y and X→$\boxed{?}$Y contradict each other, use resolution to tell what can be inferred from both

x—> Y , X —> ! Y
X is False

question 5) Do the two statements X→Y and $\boxed{?}$X→Y contradict each other, use resolution to tell what can be inferred from both

X —> Y , ! X —> Y

X must be true