CSE541   INTUITIVE PREDICATE LOGIC TEST
(10 extra points)

NAME   **ID#**

SHORT QUESTIONS

  Circle proper answer. Write one sentence justification

1. $\exists x(x < 1) \cup 2 + 2 = 4$ is a true statement in a set of natural numbers numbers

    JUSTIFY:

                                          y   n

2. $\forall_{x \in R}(x^2 < 0) \Rightarrow \forall_{x \in R}(x \geq 0)$

    JUSTIFY:

                                          y   n

3.   For predicate formulas A(x), B(x),
    $\exists x(A(x) \cup B(x)) \equiv (\exists x A(x) \cup \exists x B(x))$

    JUSTIFY:

                                          y   n

4.   For predicate formulas A(x), B(x),
    $\neg \forall x(A(x) \cap B(x)) \equiv (\exists x \neg A(x) \cup \exists x \neg B(x))$

    JUSTIFY:

                                          y   n

5.   For predicate formulas A(x), B(x),
    $\forall x(A(x) \cap B(x)) \equiv (\forall x A(x) \cap \forall x B(x))$

    JUSTIFY:

                                          y   n

6.   The formula $\forall x(C(x) \Rightarrow F(x))$
    represents sentence: *All trees can fly* in a domain $X \neq \emptyset$

    JUSTIFY:

                                          y   n

7. $\neg \exists n \forall x(x \geq \frac{1+x}{n+1}) \equiv \forall n \exists x(x < \frac{1+x}{n+1}))$

    JUSTIFY:

                                          y   n

8. $\neg\exists n\exists x(x < \frac{1+n}{n+1}) \equiv \forall n\forall x(x \geq \frac{1+n}{n-1}))$
JUSTIFY:

y   n

9. The formula $\exists x((C(x) \cap F(x)) \Rightarrow Y(x))$
represents sentence: *Some blue flowers are yellow* in a domain $X \neq \emptyset$
JUSTIFY:

y   n

10. For any predicates A(x), B(x), the formula
$((\forall x A(x) \cup \forall x B(x)) \Rightarrow \forall x(A(x) \cup B(x)))$ is a predicate tautology

JUSTIFY:

y   n

11. $\exists x A(x) \Rightarrow \forall x A(x)$ is a predicate tautology.
JUSTIFY:

y   n

12. For predicate formulas A(x), B(x),
$\neg\forall x(A(x) \cap B(x)) \equiv (\neg\forall x A(x) \cup \exists x\neg B(x))$

JUSTIFY:

y   n

13. $\forall x(A(x) \Rightarrow A(x))$ is a predicate tautology

JUSTIFY:

y   n

14. For predicate formulas A(x), B(x),
$\exists x(A(x) \cup B(x)) \equiv (\exists x A(x) \cup \exists x B(x))$

JUSTIFY:

y   n

15. $\forall x \in R(x^2 < 0) \Rightarrow \exists x \in R(x^2 < 0)$
is a true mathematical statement

JUSTIFY:

y   n

16. $\forall_{x^2<0}(x + 1 = 4) \Rightarrow \exists_{x^2<0}(x + 1 = 4)$
is a true mathematical statement in the set R of real numbers

JUSTIFY:

y   n

17. $\neg\forall n\exists x(x < \frac{1+n}{n+1}) \equiv \exists n\forall x(x \geq \frac{1+n}{n-1}))$
JUSTIFY:

y   n

2

18. $x + y > 0$, for $x, y \in N$ is a (mathematical) predicate with the domain N.
      JUSTIFY:

         y   n

19.   For predicate formulas A(x), B(x),
      $(\exists x(A(x) \cup B(x))) \equiv (\exists x A(x) \cup \exists x B(x))$
      JUSTIFY:

         y   n

20. $\forall_{x \in R}(x^2 < 0) \Rightarrow \exists_{x \in R}(x^2 > 0)$
      is a true mathematical statement

      JUSTIFY:

         y   n

21.   For any predicate formula A(x), the formula
      $(\forall x A(x) \Rightarrow \exists x A(x))$ is a predicate tautology

      JUSTIFY:

         y   n

22.   For any predicate formulas A(x), B, (this means that B does not contain the variable x) the
      formula
      $(\forall x(A(x) \Rightarrow B) \Rightarrow (\exists x A(x) \Rightarrow B))$ is a predicate tautology

      JUSTIFY:

         y   n

23.   For any predicate formulas A(x), B(x), the formula
      $(\exists x((A(x) \cap B(x)) \Rightarrow (\exists x A(x) \cap \exists x B(x)))$ is a predicate tautology

      JUSTIFY:

         y   n

24.   For any predicate formulas A(x), B(x), the formula
      $(\forall x(A(x) \cup B(x)) \Rightarrow (\forall x A(x) \cup \forall x B(x)))$ is a predicate tautology

      JUSTIFY:

         y   n

25.   For any predicate formulas A(x), B(x), the formula
      $(\forall x(A(x) \Rightarrow B(x)) \Rightarrow (\forall x A(x) \Rightarrow \forall x B(x)))$ is a predicate tautology

      JUSTIFY:

         y   n

26.   For any predicate formulas A(x), B(x), the formula
      $(\exists x(A(x) \Rightarrow B(x)) \Rightarrow (\forall x A(x) \Rightarrow \exists x B(x)))$ is a predicate tautology

      JUSTIFY:

         y   n

27. For any predicate formulas A(x), B(x), the formula
$(\forall x((A(x) \cap B(x)) \Rightarrow (\exists x A(x) \cap \exists x B(x))))$ is a predicate tautology

JUSTIFY:

y   n

28. For any predicate formula A(x) the formula
$(\forall x A(x) \Rightarrow \forall A(x))$ is a predicate tautology.
JUSTIFY:

y   n

29. For any predicate formulas A(x), B, (this means that B does not contain the variable x) the
formula
$\forall x(A(x) \Rightarrow B) \Rightarrow (\exists x A(x) \Rightarrow B)$ is a predicate tautology

JUSTIFY:

y   n

30. For any predicate formulas A(x), B(x), the formula
$(\exists x((A(x) \cap B(x)) \Rightarrow (\exists x A(x) \cap \exists x B(x))))$ is a predicate tautology

JUSTIFY:

y   n

31. For any predicate formulas A(x), B(x), the formula
$\forall x(A(x) \cup B(x)) \Rightarrow (\forall x A(x) \cup \forall x B(x))$ is a predicate tautology
JUSTIFY:

y   n

32. For any predicate formulas A(x), B(x), the formula
$(\forall x(A(x) \Rightarrow B(x)) \Rightarrow (\forall x A(x) \Rightarrow \forall x B(x)))$ is a predicate tautology

JUSTIFY:

y   n

33. For any predicate formulas A(x), B(x), the formula
$((\exists x A(x) \cap \exists x B(x)) \Rightarrow \exists x(A(x) \cap B(x)))$ is a predicate tautology

JUSTIFY:

y   n