# CSE371 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**

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
$(\forall x((A(x) \cap B(x)) \Rightarrow (\exists xA(x) \cap \exists xB(x)))$ is a predicate tautology

JUSTIFY:

**y** **n**

28. For any predicate formula A(x) the formula
$(\forall xA(x) \Rightarrow \forall A(x))$ 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
$\forall x(A(x) \Rightarrow B) \Rightarrow (\exists xA(x) \Rightarrow B)$ is a predicate tautology

JUSTIFY:

**y** **n**

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

JUSTIFY:

**y** **n**

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

**y** **n**

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

JUSTIFY:

**y** **n**

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

JUSTIFY:

**y** **n**