# CSE371 INTUITIVE PREDICATE LOGIC TEST - due December 8
# (10 extra points)

**NAME** **ID#**

**SHORT QUESTIONS**

**Circle proper answer. Write one sentence justification**

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

**y n**

2. For any predicates 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**

3. For any predicates A(x), B, (this means that B does not contain the variable x)
$\neg\exists x(A(x) \cap B) \equiv \forall x \neg(A(x) \cap \neg B)$.
JUSTIFY:

**y n**

4. $(A(x) \Rightarrow A(x))$ is a predicate tautology.
JUSTIFY:

**y n**

5. $\forall x(A(x) \cap B(x)) \equiv (\forall x A(x) \cap \forall x B(x))$
JUSTIFY:

**y n**

6. $\exists x(A(x) \cup B(x)) \equiv (\exists x A(x) \cup \exists x B(x))$
JUSTIFY:

**y n**

7. $\forall x(x < 0) \Rightarrow 2 + 2 \neq 4$ is a true statement in a set of natural numbers.
JUSTIFY:

**y n**

8. $\forall x \in R(x^2 < 0) \Rightarrow \forall x \in R(x^2 \geq 0)$
JUSTIFY:

**y n**

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

**y n**

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

**y** **n**

11. $\forall x \in R(x^2 \geq 0) \Rightarrow \exists x \in R(x^2 \geq 0)$ is a true mathematical statement.
JUSTIFY:

**y** **n**

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

**y** **n**

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

**y** **n**

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

**y** **n**

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

**y** **n**

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

**y** **n**

17. $\exists xA(x) \Rightarrow \forall xA(x)$ is a predicate tautology.
JUSTIFY:

**y** **n**

18. $\neg\forall x(A(x) \cap B(x)) \equiv (\neg\forall xA(x) \cup \exists x\neg B(x))$.
JUSTIFY:

**y** **n**

19. $\neg\exists x(A(x) \cap B) \equiv \forall x\neg(A(x) \cup \neg B)$.
JUSTIFY:

**y** **n**

20. $(A(x) \Rightarrow A(x))$ is a predicate tautology.
JUSTIFY:

**y** **n**

21. $\forall x(A(x) \cap B(x)) \equiv (\forall xA(x) \cup \forall xB(x))$
JUSTIFY:

**y** **n**

22. $\exists x(A(x) \cup B(x)) \equiv (\exists xA(x) \cup \exists xB(x))$
JUSTIFY:

**y** **n**

23. $\forall x(x<1) \cup 2+2 \neq 4$ is a true statement.
JUSTIFY:

**y** **n**

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

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

**y** **n**

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

**y** **n**

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

**y** **n**

28. $(\exists x(A(x) \cup B(x))) \equiv (\exists x A(x) \cup \exists x B(x))$
JUSTIFY:

**y** **n**

29. $\forall x(x < 1) \cup 2 + 2 \neq 4$ is a true statement.
JUSTIFY:

**y** **n**

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

**y** **n**

31. The formula $\forall x(C(x) \cap F(x))$ represents sentence: *All birds can fly* in in the domain $X \neq \emptyset$.
JUSTIFY:

**y** **n**

32. For any propositional function A(x) the formula
$(\forall x A(x) \Rightarrow \exists x A(x))$ is a predicate tautology.
JUSTIFY:

**y** **n**

33. For any predicates 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**

34. For any predicates 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**

35. For any propositional functions 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**

36. For any predicates 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**

37. For any predicates 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**

38. For any predicates 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**

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

**y** **n**

40. For any predicates 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**

41. For any predicates 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**

42. For any predicates 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**

43. For any predicates 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**

44. For any predicates 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**