Practice test 1 Name: _____

1. Write the converse, inverse and contrapostive of the compound statement: If pigs could fly there would be bacon in the trees.

   (a) converse

   (b) inverse

   (c) contrapositive

2. Write a truth table for $(p \vee q) \rightarrow (p \wedge q)$

p	q	$p \vee q$	$p \wedge q$	$(p \wedge q) \rightarrow (p \vee q)$
T	T			
T	F			
F	T			
F	F			

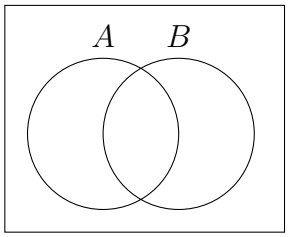
3. Prove $\neg(p \wedge q) \equiv \neg p \vee \neg q$ using a truth table.

4. Negate the statement "Every good boy does fine."

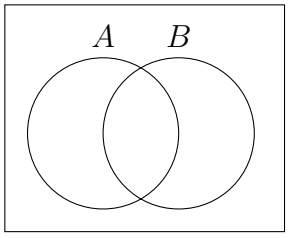
5. Negate the statement $\forall x P(x)$

6. Show $\overline{(A \cap B)} = \overline{A} \cup \overline{B}$ using Venn diagrams.

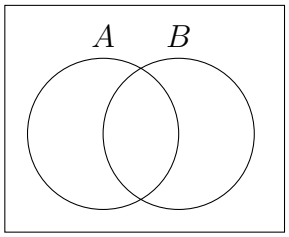
(a) $A \cup B$



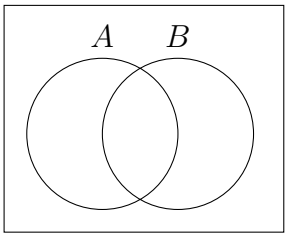
(b) $A \cap B$



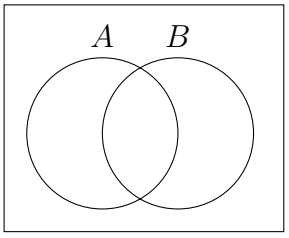
(c) $\overline{A}$



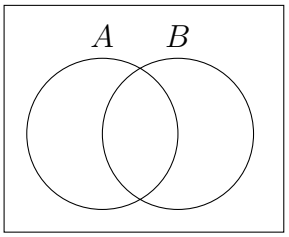
(d) $\overline{B}$



(e) $\overline{A} \cap \overline{B}$



(f) $\overline{(A \cup B)}$



Write the following statements in English, and negate each statment (in English). Determine whether the original statement is true, and give a justification. The domain of each statement is $\mathbb{N} = \{1, 2, 3, ...\}$

7. $\forall x \exists y (y = 2x)$

   (a) English

   (b) Negation

   (c) True or False

   (d) Justification

8. $\forall y \exists x (y = 2x)$

   (a) English

   (b) Negation

   (c) True or False

   (d) Justification

9. Definition: A function $f : A \to B$ is injective (one to one) if and only if

10. Negate the definition: $f : A \to B$ is not injective if and only if

11. Definition: A function $f : A \to B$ is surjective (onto) if and only if

12. Negate the definition: $f : A \to B$ is not surjective if and only if

13. Let $f : \mathbb{R}\backslash\{1\} \to \mathbb{R}\backslash\{0\}$ via $x \mapsto \frac{1}{x-1}$ i.e. $f(x) = \frac{1}{x-1}$

    (a) Show that f is injective.

    (b) Find an explicit formula for $f^{-1}(x)$

14. Prove the (rather obvious) fact that if n is an integer and $3n-2$ is even, then n is even

    (a) by contraposition

    (b) by contradiction