

## MATH 13 HOMEWORK 1

**DUE: Wednesday, Apr 11**

**INSTRUCTIONS:** Work on this homework in groups of 1-3 persons. When you turn in the homework, put the names of your group members on the front page. Also, clearly indicate who writes what problems on the homework's solution.

**READING ASSIGNMENT:** Read Chapter 1, Sections 2.1, 2.2 of the course notes.

**PROBLEMS FROM COURSE NOTES:** Do problems 2.1.5, 2.1.10, 2.2.7(a), 2.2.12

**ADDITIONAL PROBLEMS:**

1. Consider the following proposition: "If Bill takes Sam to the concert, then Sam will take Bill to dinner".

Which of the following implies that this statement is true?

- (a) Sam takes Bill to dinner only if Bill takes Sam to the concert.
  - (b) Either Bill doesn't take Sam to the concert or Sam takes Bill to dinner.
  - (c) Bill takes Sam to the concert.
  - (d) Bill takes Sam to the concert and Sam takes Bill to dinner.
  - (e) Bill takes Sam to the concert and Sam doesn't take Bill to dinner.
  - (f) The concert is cancelled.
  - (g) Sam doesn't attend the concert.
2. There is a unique solution to the KenKen puzzle shown in Figure 1. Pick one of the 16 squares in this diagram, determine what its value is in the unique solution to the KenKen puzzle, and carefully prove your answer is correct. (Do not solve the entire puzzle!)
  3. Consider the sentence "The integers  $x$  and  $y$  are both greater than or equal to 10." What is the negation of this sentence? Write it in a way that doesn't use the word "not".
  4. (a) Prove or disprove: If an integer  $n$  is not divisible by 3, then there exists an integer  $k$  such that  $n = 3 \cdot k + 1$ .  
(b) Assume  $n$  is not divisible by 3. Prove that  $n^2 - 1$  is divisible by 3. (Hint. Use cases, where one case is that  $n = 3 \cdot k + 1$ .)
  5. Using a truth table, show that

$$P \Rightarrow (Q \wedge R)$$

is logically equivalent to

$$(P \Rightarrow Q) \wedge (P \Rightarrow R).$$

Write out what these two statements mean using words like "implies", "or", "and", and "not". (You don't have to use all of those words.) Does it seem reasonable that the two statements are logically equivalent?

### Inky #1

1 -		2 /	5 +
2 /	5 +		
		1 -	6 ×
4 ×			

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Figure 1: This is a KenKen puzzle.

6. Is

$$(P \wedge Q) \Rightarrow (P \vee Q)$$

a tautology? Explain.