Exam II
Math 2513-001
March 27, 2009

Problem 1:          Problem 2:
Problem 3:          Problem 4:
Total:
1. Show (either using Venn diagrams or by a direct argument) that if $A$ and $B$ are sets then $(A - B) \cup (A \cap \overline{B}) = A$. 
2(a) Let $a, b, c$ be integers. Prove that if $a|b$ and $b|c$ then $a|c$.

2(b) If $A = \{a, b\}$, write out the set (as a list of its elements) $P(A) \times A$. (Recall that $P$ denotes the power set.)
3(a) Find the domain and image of the function that assigns to each positive integer the number of the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 that do not appear as decimal digits in the integer.

3(b) Determine which of these functions $f : \mathbb{Z} \times \mathbb{Z} \rightarrow \mathbb{Z}$ is onto (and give brief explanations):

(i) $f(m, n) = 2m - n$

(ii) $f(m, n) = m^2 - 4$

(iii) $f(m, n) = |m| - |n|$
4(a) Graph carefully the function $f(x) = 5[x/5]$.

4(b) Find $f^{-1}([x \mid 5 < x < 10])$ and $f^{-1}([15, 20])$. 