CSE 355: Intro to Theoretical Computer Science
Recitation #1 (20 pts)

1. [5pts] Write a short informal English description of the following sets.

   Example: S = {1,3,5,7,...}
   Description: Set of all positive odd integers

a) A = {..., -4, -2, 0, 2, 4, …}

   The set containing all even integers

b) A = {n | n = 2m for some m in N}

   The set of positive even integers

c) A = {n | n = 2m for some m in N and n = 3k for some k in N}

   Set of positive integers that are a multiple of 6

d) A = {w | w is a string of 0's and 1's and w equals the reverse of w itself}

   Set of all palindrome binary numbers

e) A = {n | n is an integer and n = n + 1}

   The empty set

2. [5 pts] Write a formal description of the following sets.

   Example: The set containing the numbers 1, 10, and 100
   Formal Description: S = {1, 10, 100}

a) The set containing all integers that are greater than 5.

   S = {n | n > 5 for some n in Z}

b) The set containing all-natural numbers that are less than 5.

   S = {n | n < 5 for some n in N}

c) The set containing the string *aba*

S = {aba}

d) The set containing the empty string

S = {ε}

e) The set containing nothing at all

S = {} or ∅

3. [5 pts] Let A be the set {x, y, z} and B be the set {x, y}, answer the following question:

a) Is A a subset of B?

A is not a subset of B

b) What is A ∪ B?

A ∪ B = {x, y, z}

c) What is A ∩ B?

A ∩ B = {x, y}

d) What is A *X* B?

A *X* B = {(x, x), (x, y), (y, x), (y, y), (z, x), (z, y)}

e) What is the power set of B?

The power set of B is {∅, {x}, {y}, {x, y}}

4. [5 pts] Let X be the set {1, 2, 3, 4, 5} and Y be the set {6, 7, 8, 9, 10}. The unary function f: X → Y and the binary function g: X x Y → Y are described.

a) What is the value of f(2)?

f(2) = 7

b) What is the range and domain of f?

The domain is {1, 2, 3, 4, 5}
The range is {6, 7}

c) What is the value of g(2, 10)?

g(2, 10) = 6

d) What is the range and domain of g?

The domain is {1, 2, 3, 4, 5} x {6, 7, 8, 9, 10}
The range is {6, 7, 8, 9, 10}

e) What is the value of g(4, f(4))?

f(4) = 7
g(4, f(4)) = g(4, 7) = 8