**CS204 Discrete Mathematics, Spring 2018**

Recitation #4

Time: 2018.03.29 (Thu) 19:00 ~ 19:30

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1. Determine whether each of these functions is a bijection

from R to R.

a) f (x) = 2x + 1

b) f (x) = $x^{2}$ + 1

c) f (x) = $x^{3}$

d) f (x) = $(x^{2}+1)/(x^{2}+2)$

Sol)

a)T

b)F

c)T

d)F (both the denominator and the numerator are always positive)

2. Let $f\left(x\right)=\left⌊x^{2}/3\right⌋$. Find f (S) if

a) S = {−2, −1, 0, 1, 2, 3}.

b) S = {0, 1, 2, 3, 4, 5}.

c) S = {1, 5, 7, 11}.

d) S = {2, 6, 10, 14}.

Sol)

a) {0, 1, 3}

b) {0, 1, 3, 5, 8}

c) {0, 8, 16, 40}

d) {1, 12, 33, 65}

3. Determine whether f : Z × Z → Z is onto if

a) f (m, n) = 2m − n.

\*b) f (m, n) = $m^{2}-n^{2}$

c) f (m, n) = m + n + 1.

d) f (m, n) = |m|−|n|.

e) f (m, n) = $m^{2}-4$

(Z means the set of all integers)

Sol)

a) T

b) F It is impossible to be (m+n)(m-n) = 2. If |m-n|=1, then |m+n| is odd. If |m-n|=2, then (m+n) is even.

c) T

d) T

e) F

4. Suppose that the number of bacteria in a colony triples

every hour.

a) Set up a recurrence relation for the number of bacteria

after n hours have elapsed.

b) If 100 bacteria are used to begin a new colony, how

many bacteria will be in the colony in 10 hours?

Sol)

a) a\_{n+1} = a\_n \* 3

b) 100 \* 3^10

5. Show that the sequence {an}is a solution of the recurrence relation $a\_{n}=-3a\_{n-1}+4a\_{n-2}$ if

a) $a\_{n}=0$

b) $a\_{n}=1$

c) $a\_{n}=\left(-4\right)^{n}$

d) $a\_{n}= 2\left(-4\right)^{n}+3$

Sol) omitted