Quiz 1 Version E Fri Jan 13, 2012

SCORE: / 20 POINTS

Let 
$$F = \{-1, 0, 1\}$$
.

SCORE: \_\_\_ / 5 POINTS

Let 
$$G = \{0, 1, 2\}$$
.

Let K be the relation from F to G defined by xKy if and only if  $x^2 - y^2$  is a multiple of 3.

[a] Write K in set roster notation.

$$\{(-1,1), (-1,2), (0,0), (1,1), (1,2)\}$$

 $\frac{1}{2}$  point for each ordered pair =  $\frac{2}{2}$  points total

**⇒**SUBTRACT ½ point if not written in proper set notation

[b] Is K a function? Why or why not?

No. 
$$(-1, 1) \in K$$
 and  $(-1, 2) \in K$ , but  $1 \neq 2$ 

1 point (no points for "NO" if incorrect reason given)

OR

No. 
$$(1, 1) \in K$$
 and  $(1, 2) \in K$ , but  $1 \neq 2$ 

1 point (no points for "NO" if incorrect reason given)

[c] If  $H = \{3, 4\}$ , write  $H \times G$  in set roster notation.

$$\{(3,0), (3,1), (3,2), (4,0), (4,1), (4,2)\}$$

 $\frac{1}{4}$  point for each ordered pair =  $\frac{1}{2}$  points total

**⇒**SUBTRACT ½ point if not written in proper set notation

Let 
$$A = \{x \in Z \mid x^2 < 5\}$$
.

SCORE: / 4 POINTS

Let 
$$B = \{x \in Z^{nonneg} \mid x^3 < 9\}$$
.

Let 
$$C = \{x \in Z \mid 0 \le x < 3\}$$
.

Are the following statements true or false? Explain **very briefly** your answers. (No points if no explanation given.)

[a] 
$$A = C$$

False. 
$$-2 \in A$$
 but  $-2 \notin C$ .

2 points (no points for "FALSE" if incorrect reason given)

OR

False. 
$$-1 \in A$$
 but  $-1 \notin C$ .

2 points (no points for "FALSE" if incorrect reason given)

[b] B is a **proper** subset of C

False. C does not contain any element that is not in B since  $B = C = \{0, 1, 2\}$ 

2 points (no points for "FALSE" if incorrect reason given)

(even though every element of B is also in C).

MULTIPLE CHOICE:	Which of the following statements are true?		SCORE:	_/2 POINTS
	[1]	$x \in \{\{x\}, y, z\}$		

- [2]  $\{x\} \subseteq \{\{x\}, y, z\}$
- [3]  $\{z\} \subseteq \{\{x\}, y, z\}$
- (a) none of the above are true (b) all of the above are true (c) only [3] is true
- (d) only [1] and [2] are true (e) only [1] and [3] are true (f) only [2] and [3] are true

Classify each statement as Universal Conditional (<u>UC</u>), Universal Existential (<u>UE</u>) or Existential Universal (<u>EU</u>). SCORE: \_\_\_\_ / 2 POINTS

- [a] Some positive integer is less or equal to every positive integer. EU 1 point
- [b] Everyone who rides the roller coaster must be at least 54 inches tall. UC 1 point

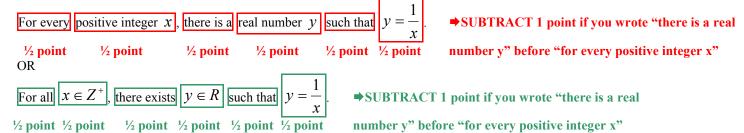
Rewrite the following statement using the formal universal existential structure mentioned in lecture.

SCORE: \_\_\_ / 3 POINTS

NOTE: The answer requires 2 variables.

You may use algebra and/or symbolic set notation where appropriate.

"Every positive integer has a reciprocal."



If 
$$W = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$
 and  $Y = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$ , score: \_\_\_\_/ 1 POINTS how many elements are in  $Y \times W$ ?

$$11 \times 13 = 143$$
 1 point

Write the **formal definition** of a function used in discrete math. Use correct English and mathematical notation. **SCORE:** /3 POINTS

A relation R from set A to set B is a function if and only if

for all  $x \in A$ , there exists  $y \in B$  such that  $(x, y) \in R$ 

and for all  $x \in A$ , for all  $y, z \in B$ , if  $(x, y) \in R$  and  $(x, z) \in R$ , then y = z