Discrete Math – Session 33

Example 1: Recall that a function f: X µ Y (from X into Y) is onto S, where S f Y iff œy0S ›x0X ý f(x) = y. Show that ***f***: Q µ Q defined by ***f***(x) = 5 – 3x is onto Q.

Example 2: Recall that a function f: X µ Y is 1-1 iff œx_1, x_2 0 X if f(x_1) = f(x_2), then x_1 = x_2. Show that the function ***f*** defined in *Example 1* is 1-1.

Relations

Suppose A and B are sets. A **relation *R* from A to B** is a subset of A H B. Given an ordered pair (x,y) 0 A H B, we say x is related to y by ***R***, denoted by x ***R*** y, iff (x,y) 0 ***R***.

Example 3: Let A = {0, 1, 2, 3, 4} and B = {1, 2, 3, 4, 5}, suppose ***R*** is the relation from A to B defined by ***R*** = {(x,y): x < y }. That is, x ***R*** y iff (x,y) 0 ***R***. Or equivalently, œx0Aœy0B, x ***R*** y iff x < y.

List the ordered pairs in ***R***.

Example 4: Consider the relation ***C_4*** from Z to Z defined as follows:
œ(m,n) 0 Z H Z, m ***C_4*** n iff 4 * (m – n). Now, describe the set of all m 0 Z such that (m,3) 0 ***C_4***. That is, define by the listing method {m 0 Z : m ***C_4*** 3 }.

Example 5: Consider the relation ***F*** from Q to Q defined by (x,y) 0 ***F*** iff y = ***f***(x) where ***f*** is the function of Example 1. Equivalently, x ***F*** y iff y = 5 – 3x. Describe the set of ordered pairs in ***F***.