Math 314 Summer 2011
6/27/2011 Quiz #15

Name: Key

Show all work clearly and in order. 10 minutes.

1. A relation $\mathbf{R}$ is defined on $\mathbb{R} \times \mathbb{R}$ as follows:

$$\forall (x_1, y_1), (x_2, y_2) \in \mathbb{R} \times \mathbb{R}, \qquad (x_1, y_1)\mathbf{R}(x_2, y_2) \iff x_1 = x_2.$$

(a) Show $\mathbf{R}$ is reflexive.

Let $(x_1, y_1) \in \mathbb{R} \times \mathbb{R}$
Notice that $x_1 = x_1$
Therefore, $(x_1, y_1) R (x_1, y_1)$
Hence, R is reflexive.

(b) Show $\mathbf{R}$ is symmetric.

Let $(x_1, y_1), (x_2, y_2) \in \mathbb{R} \times \mathbb{R}$
Suppose $(x_1, y_1) R (x_2, y_2)$
Hence, $x_1 = x_2$
Thus, $x_2 = x_1$
Therefore, $(x_2, y_2) R (x_1, y_1)$ and R is symmetric.

(c) Show $\mathbf{R}$ is transitive.

Let $(x_1, y_1), (x_2, y_2), (x_3, y_3) \in \mathbb{R} \times \mathbb{R}$
Suppose $(x_1, y_1) R (x_2, y_2)$ and $(x_2, y_2) R (x_3, y_3)$
So $x_1 = x_2$ and $x_2 = x_3$
Since $x_1 = x_2 = x_3$ we have $x_1 = x_3$
Therefore $(x_1, y_1) R (x_3, y_3)$ and R is transitive.