

Name \_\_\_\_\_ Transitions, Quiz 4

1) Solve  $4x = 3 \pmod{99}$ .

Consider the equivalence relation on  $\mathbb{R}^2$  that identifies points that are the same distance from the origin with each other. For instance,  $(5, 0)$ ,  $(0, 5)$ ,  $(-5, 0)$ ,  $(0, -5)$ ,  $(3, 4)$ ,  $(4, 3)$ ,  $(-3, 4)$ , among many other points should all be equivalent.

2a) Write down the equivalence relation as a set.

2b) Describe the equivalence relation as an "iff" statement.

2c) Sketch a graph of the equivalence class of  $(0, 5)$ .

3) Consider the following total order relation on  $\mathbb{Z}_{\geq 0}$ . We're going to split the positive integers into two groups: All even integers come before all odd integers. Within each group, use the standard ordering. For example, if we call this relation " $\preceq$ " then we see that  $2 \preceq 6$ ,  $3 \preceq 5$ , and  $8 \preceq 7$ .

Provide a sketch a proof that " $\preceq$ " is a total order relation.