Math 1165 **Study guide** **Test 2**

1. Use the Euclidean algorithm to solve the decanting problem for a given pair of integers. In other words, given integers s and t, find x and y such that $sx + ty = gcd(s, t)$.

2. For a given digit b, find the base b representation of an integer n by repeated division and by repeated subtraction.

3. For a given digit b, find the base b representation of a rational number r.

4. For a negative integer b in the range $-3, -4, -5, -6$, find the base b representation of an integer N.

5. Give a relation defined on a set of numbers by means of a formula, prove that the relation has certain of the properties $\{R, S, A, T\}$.

6. Solve place value problems like the ones numbered 12 to 16 in `http://www.math.uncc.edu/~hbreiter/m1165/PlaceValue.pdf`

7. Given a relation R from X to Y, find the matrix M_R of R. Find the product of two such Boolean matrices and use their product to find their composition.

8. Prove that a given relation is *blank* given that it is the union/ intersection/inverse/compliment of *blank* relations, where *blank* refers to one of the properties we've studied.

9. Count the number of *blank* relations on a given set using the idea that we have certain options in building the Boolean matrix that represents such a *blank* relation.

10. Find an example of a relation on a given set that has the following properties: 1. it has k ordered pairs, 2. it satisfies *blank*1 and *blank*2 but not *blank*3.

11. Modular arithmetic and remainder problems, especially when $m = 3, 9$, and 11. For example, describe the cells determined by the relation $x \equiv y \bmod 5$ or find the remainder when 2^{2005} is divided by 5 (ie, what is $2^{2005} \bmod 5$?).