

COT 3100H Final Exam - Part A (Relations, Functions) - 25 pts (4/26/2023)

Last Name: _____ , **First Name:** _____

1) (10 pts) Let the function $f(x)$ be defined as follows: $f(x) = \frac{3x+7}{x-4}$, with a domain of $\mathcal{R} - \{4\}$. Determine (a) $f^{-1}(x)$ and (b) the domain of $f^{-1}(x)$.

$f^{-1}(x) =$ _____ , Domain of $f^{-1}(x) =$ _____

2) (10 pts) Define the relation R_n (over the set of integers) for integers $n \geq 2$ as follows:

$$R_n = \{(a, b) \mid ab \equiv 1 \pmod{n}\}$$

With proof, determine if R_n is (a) reflexive, (b) irreflexive, (c) symmetric, (d) anti-symmetric and (e) transitive. (Note: To prove one of these properties, you must prove it for all integers $n \geq 2$. To disprove a property, you just need a single counter-example for a single chosen value of n . In these cases, you will only get full credit if you clearly indicate your selected value of n as well as the other values necessary for the counter-example.)

3) (5 pts) Let $A = \{a, b, c, d, e, f, g\}$ and $B = \{1, 2, 3\}$. How many surjective functions are there with a domain of A and a co-domain of B ? Leave your answer in powers, factorials, etc. and describe conceptually what each term in your answer represents.

Scratch Page – Please clearly mark any work on this page you would like graded.