CS 173, Summer 19 Examlet 5

Name:_____

NetID:_____ **Lecture: A**

Discussion: Monday & Wednesday 1:30 2:30

1. (10 points) Suppose that $f : \mathbb{Z} \to \mathbb{Z}$ is one-to-one. Let's define $g : \mathbb{Z} \to \mathbb{Z}^2$ by $g(n) = (|n|, f(n)|n|)$. Prove that g is one-to-one.

2. (5 points) Using precise mathematical words and notation, define what it means for a function $g : M \to C$ to be "onto." You must use explicit quantifiers. Do not assume the reader knows what the image of the function is.

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1. (5 points) How many different 13-letter strings beginning with ma can be made be rearranging the letters in the word ``massachusetts''? Show your work.

2. (10 points) Check the (single) box that best characterizes each item.

The composition of two one-to-one functions is one-to-one. true ☐ false ☐

$f : \mathbb{N}^2 \to \mathbb{N}$
$f(p, q) = pq$ onto ☐ not onto ☐ not a function ☐

$g : \mathbb{R} \to \mathbb{Z}$
$g(x) = |x|$ one-to-one ☐ not one-to-one ☐ not a function ☐

Each elf has exactly one gift: charm, strength, or stamina. If there are 10 elves, there must be at least three elves with the same gift. true ☐ false ☐

$\forall p \in \mathbb{Z}^+,\ \exists t \in \mathbb{Z}^+,\ \gcd(p, t) = 1$ true ☐ false ☐