Name: ______________________________ CompID: ______________

CS 2102 - DMT1 - Spring 2020 — Luther Tychonievich
Administered in class friday march 6, 2020

# Quiz 07

**problem 1** *Convert to prose*

$S$: the set of all snakes
$R$: the set of all rabbits
$E(x,y)$: $x$ eats $y$
$Y(x)$: $x$ is yellow

Convert the following to simple, readable English:

1. $\exists r \in R \,.\, \forall s \in S \,.\, (E(s,r) \rightarrow \neg Y(s))$

There is a rabbit that no yellow snake eats.

**problem 2** *Primes and factors*

2. $2 \cdot 3^2$ ______ is the prime factorization of 18

3. $3^4$ ______ is the prime factorization of 81

4. $2^{20} \cdot 3^{40}$ ______ is the prime factorization of $9^{10} \cdot 6^{20}$

5. $\{1,3,7,9\}$ ______ is the set positive 1-digit numbers relatively prime with 10

PROBLEM 3 *Proof by contradiction*

Prove the following using proof-by-contradiction. You may use prose or symbols or any readable mix of the two.

6. $\frac{7}{3} \notin \mathbb{Z}$

*Proof.*

We proceed by contradiction.
Assume $\frac{7}{3} \in \mathbb{Z}$; let $x \in \mathbb{Z}$ be the element of $\mathbb{Z}$ that equals $\frac{7}{3}$. Thus, $\frac{7}{3} = x$, which can be re-written as $7 = 3x$. By the fundamental theorem of arithmetic, both must have the same prime factors, but 3 is a factor of $x$ and is not a factor of 7, a contradiction.
Because assuming $\frac{7}{3} \in \mathbb{Z}$ led to a contradiction, it must be the case that $\frac{7}{3} \notin \mathbb{Z}$. □