Chapter 3

Formal Proofs

Bahar Aameri
Department of Computer Science
University of Toronto

Feb 09, 2015

Today's Topics

- **Exercise: Formal Proofs**

Direct Proof of the Existential

Exercises

Use the proof structures in this course to **prove** or **disprove** the following claims

1. $\forall x \in \mathbb{R}, \forall y \in \mathbb{R}, (x < y) \Rightarrow (\exists z \in \mathbb{R}, (x < z) \wedge (z < y))$.

2. $\forall m \in \mathbb{N}, \forall n \in \mathbb{N}, (m < n) \Rightarrow (\exists k \in \mathbb{N}, (m < k) \wedge (k < n))$

3. For all quadruples of **positive** real numbers w, x, y, z, If $w/x < y/z$ then:

$$\left(\frac{w}{x} < \frac{w+y}{x+z}\right) \wedge \left(\frac{w+y}{x+z} < \frac{y}{z}\right)$$

4. For every pair of **positive** natural numbers (m, n), if $m \geq n$, then the $\gcd(m, n) = \gcd(n, m - n)$.
   Note: $\gcd(m, n)$ denotes "**greatest common divisor of** m **and** n."
   The largest positive integer that divides both m and n.