CS 421 --- Type Semantics Activity (Monotype Version)

Manager	Keeps team on track	
Recorder	Records decisions / QC	
Reporter	Reports to class	
Reflector	Assesses team performance	

Please write your name/netid legibly in dark ink. Hand in one copy per team. Do not staple or mangle the corners.

The Rules

The Language

$L ::=$	$\lambda x.L$	abstractions
$\mid$	$L\ L$	applications
$\mid$	**let** $x = L$ **in** L	Let expressions
$\mid$	**if** L **then** L **else** L	If expressions
$\mid$	E	expressions
$E ::=$	x	variables
$\mid$	n	integers
$\mid$	b	booleans
$\mid$	$E \oplus E$	integer operations
$\mid$	$E \sim E$	integer comparisons
$\mid$	$E \,\&\&\, E$	boolean and
$\mid$	$E \mid\mid E$	boolean or

Reductions

Reduce the following programs according to the semantic rules given.

Problem 1)

{x:Int,y:Int} $\vdash$ **if** $x * y > 2$ **then** x **else** $y\ :\ Int$

Problem 2)

{x:Int,y:Int} $\vdash$ **let** $m = x * y$ **in** $m - x\ :\ Int$

Problem 3)

{} $\vdash (\lambda f.\lambda x.f\ x)\ (\lambda x.x)\ 10\ :\ Int$

Make your own rules!

Problem 4)

Try to write the type rules for HASKELL's `head` and `tail` functions.

Problem 5)

The logical rule for *Modus Ponens* looks like this:

$$\frac{A \to B \quad A}{B}$$

Is there a programming language equivalent to this?[1] Talk to a neighbor and see if you can find a semantic rule that mirrors this.

Problem 6) What happens when you try to type check this code? Try to derive α.

`{y:Int,z:String}` $\vdash (\lambda f.(fy, fz))\ (\lambda x.x) : \alpha$

[1] Hint, the answer is "yes".

Type Semantics Activity (Monotype Version)--- Reflector's Report

Manager	Keeps team on track	
Recorder	Records decisions	
Reporter	Reports to Class	
Reflector	Assesses team performance	

1. What was a strength of your team's performance for this activity?

2. What could you do next time to increase your team's performance?

3. What insights did you have about the activity or your team's interaction today?

Type Semantics Activity (Monotype Version) --- Team's Assessment (SII)

Manager or Reflector: Consider the objectives of this activity and your team's experience with it, and then answer the following questions after consulting with your team.

1. What was a **strength** of this activity? List one aspect that helped it achieve its purpose.

2. What is one things we could do to **improve** this activity to make it more effective?

3. What **insights** did you have about the activity, either the content or at the meta level?