Numbers & Polys
MAS3300

Exam-A

Prof. JLF King
1Sep2015

Note. This is an open brain, open (pristine) Sigmon-Notes exam. Please write each solution on a separate sheet of paper. Write expressions unambiguously e.g, "$1/a+b$" should be bracketed either $[1/a]+b$ or $1/[a+b]$. (Be careful with **negative** signs!)

A1: Thm1.4f: (P.2) *If* $c \in \mathbb{R}$ *then* $c \cdot 0 = 0$.

A2: 1.4h: (P.2) *If* $b \in \mathbb{R}$ *then* $[-1] \cdot b = -b$.

A3: Prove the triangle ineq., Thm1.20g:(P.6)
If $x,y \in \mathbb{R}$ *then* $|x|+|y| \geqslant |x+y|$.

A4: [Show no work]
Write, as a union of open intervals, the set of $x \in \mathbb{R}$ such that $-8x < x^2 + 15$.
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Binops (Binary operators). On $\mathbb{R}$ define binops U and D (Up,Down) by

$$\forall b, c \in \mathbb{R}: \; b\,U\,c := \mathrm{Max}(b,c)\,; \;\; b\,D\,c := \mathrm{Min}(b,c)\,.$$

So $5\,U\,7 = 7$ and $5\,D\,7 = 5$.

On $\mathbb{R}_+ = (0,\infty)$ define binop $\triangleleft$ by

$$\forall b,c \in \mathbb{R}_+ : \; b \triangleleft c \;:=\; b^{\log(c)}\,.$$

(Here log is base 2; so $\log(16) = 4$ and $\log(\frac{1}{32}) = -5$. E.g, $3 \triangleleft 16 = 3^{\log(16)} = 3^4$, so $3 \triangleleft 16 = 81$.)

A5: For each of the following statements in quotes, provide a **proof** or a **CEX with explicit numbers**.

Recall that axiom DMA (P.1) says that multiplication distributes over addition.

a "Addition distributes over multiplication."

b "Binop D distributes over U."

c "Binop $\triangleleft$ is commutative."

d "On $\mathbb{R}_+$: Binop $\triangleleft$ left-distributes over multiplication."

End of Exam-A

A1:	___ ___	50pts
A2:	___ ___	45pts
A3:	___ ___	55pts
A4:	___ ___	30pts
A5:	___ ___	40pts
Total:	___ ___ ___	220pts

Print name ⌞. . . . . .⌟ Ord:

HONOR CODE: *"I have neither requested nor received help on this exam other than from my professor."*

Signature: ⌞. . . . . .⌟

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