

A1:	_____	45pts
A2:	_____	45pts
A3:	_____	50pts
A4:	_____	50pts
A5:	_____	70pts
Bonus:	_____	10pts

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!) Every “if” must be matched by a “then.”

A1: Please prove Thm1.4d: (P.2)
 If $e \in \mathbb{R}$ is an multiplicative-identity then $e = 1$.

Total: _____ 260pts

A2: 1.18c: (P.6) Harmonic-Mean Inequality.

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

A4: Let “*” mean “*theorems earlier than (1.15f)*”.
 Using (*) prove: Lemma: If $z \neq 0$ then z^2 is positive.
 Now use this and (*) to prove that $-1 < 0$.

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

- a** “Addition distributes over mult.” **T** **F**
- b** “Subtraction is associative.” **T** **F**
- c** On \mathbb{R} define $x \triangleleft y := [x \cdot y] + y$. Then
 “binop \triangleleft is associative”. **T** **F**
- d** On the set of all people, give an example of a binop
 which is *transitive* and *reflexive*, but is not *symmetric*.

Bonus: Define a binop “ \bowtie ” by

$$b \bowtie c := 7 - \left[[7+b] \triangleleft [7+c] \right]$$

Prove or give a CEX: “Binop \bowtie is associative.”

End of Exam-A

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

Signature:

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