Staple!

Team: ____

ACT MAA4211 7222 | **Home-B** | Prof. JLF King *Touch:* 6May2016

Hello. Essays violate the CHECKLIST at *Grade Peril*! Exam is due by **3:30PM, Tuesday, 7Oct2008**, slid completely **under** my office door, LIT402. Please write **DNE** in a blank if the described object does not exist or if the indicated operation cannot be performed.

Fill-in *all* blanks (*handwriting; don't bother to type*).

B1: Show no work.

___ ___ a_{20} Let $S := \{q \in \mathbb{Q}_+ \mid 5 \leqslant q^2 < 9\}$. Then:

$\mathrm{Cl}_{\mathbb{R}}(S)$= .... $\mathrm{Itr}_{\mathbb{R}}(S)$= ....

$\mathrm{Cl}_{\mathbb{Q}}(S)$= .... $\mathrm{Itr}_{\mathbb{Q}}(S)$= ....

___ ___ b_{14} Let $S := \{q \in \mathbb{Q}_+ \mid 5 \leqslant q^2 < 9\}$. Then:

$\partial_{\mathbb{R}}(S)$= .... $\partial_{\mathbb{Q}}(S)$= ....

___ ___ c_{18} Suppose that $U, V_1, V_2, \ldots$ are $\mathbb{R}$-open-sets, and $E, K_1, K_2, \ldots$ are $\mathbb{R}$-closed-sets. Circle those of the following sets which are guaranteed to be $\mathbb{R}$-*closed*.

$K_1 \setminus E$. $\partial_{\mathbb{R}}(E) \cap \mathrm{Itr}_{\mathbb{R}}(E)$. $\partial_{\mathbb{R}}(E) \cup \mathrm{Itr}_{\mathbb{R}}(E)$.

$\mathbb{R} \setminus [\bigcup_{n=1}^{\infty} V_n]$. $\bigcup_{n=1}^{\infty} \mathrm{Cl}_{\mathbb{R}}(V_n)$. $[\mathrm{Itr}_{\mathbb{R}}(E) \cap V_1]^c$.

___ ___ d_{10} Give an example of a set,

$\{$ .... $\in \mathbb{R} \mid$ .... $\}$,

which has $5, 8, 9 \in \mathbb{R}$ as its **only** $\mathbb{R}$-cluster points.

On $\mathbb{R}_+$, define several relations: Say that $x \mathfrak{R} y$ IFF $y - x < 17$. Define $\mathfrak{P}$ by: $x \mathfrak{P} y$ IFF $x^{\log(y)} = 5$.

Say that $x \mathfrak{I} y$ IFF $x + y$ is irrational.

Use $\bullet|$ for the "divides" relation on the positive integers: $k \bullet| n$ iff there exists a posint r with $rk = n$.

___ ___ d_1 Please circle those of the following relations that are *transitive* (on their domain of defn).

$\neq$ $\bullet|$ $\leqslant$ $\mathfrak{R}$ $\mathfrak{P}$ $\mathfrak{I}$

___ ___ d_2 Circle the *symmetric* relations:

$\neq$ $\bullet|$ $\leqslant$ $\mathfrak{R}$ $\mathfrak{P}$ $\mathfrak{I}$

___ ___ d_3 Circle the *reflexive* relations:

$\neq$ $\bullet|$ $\leqslant$ $\mathfrak{R}$ $\mathfrak{P}$ $\mathfrak{I}$

Essay questions: For each question, carefully type a triple–spaced essay solving the problem.

Each essay starts a new page.

B2: A MS (X, d) is ***sequentially compact*** if each $\vec{\mathbf{b}} \subset X$ has a subsequence $\vec{\mathbf{a}} \subset \vec{\mathbf{b}}$ which is X-convergent. Prove that X is sequentially-cpt (seq-cpt) IFF each infinite subset $S \subset X$ has a cluster point.

B3: In MS (X, d), use $B_\varepsilon(y)$ for the radius-ε ball centered at $y \in X$. The MS is ***totally bounded*** if for each posreal ε, there exists a *finite* set $\mathcal{F}_\varepsilon \subset X$ st. $[\bigcup_{z \in \mathcal{F}_\varepsilon} B_\varepsilon(z)] = X$. (I.e, these ε-balls ***cover*** X.)

Prove that X is totally bounded IFF each sequence $\vec{\mathbf{b}} \subset X$ has a subsequence $\vec{\mathbf{c}} \subset \vec{\mathbf{b}}$ which is X-Cauchy.

End of Home-B

B1:	___ ___	98pts
B2:	___ ___	45pts
B3:	___ ___	55pts
Poorly stapled, or missing ordinals :	___	−5pts
Missing names, or honor sigs :	___	−5pts
Total:	___ ___ ___	198pts

HONOR CODE: *"I have neither requested nor received help on this exam other than from my team-mates and my professor (or his colleague)."* *Name/Signature/Ord*

Ord: ....

Ord: ....

Ord: ....