Moda
MAA4227 MAA5229

Class-D

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D1: Show no work. Fill-in each blank, and circle the appropriate letter for **True/False** questions.

a For $U \subset \mathbb{R}^3$, let (¥) be stmt *"If U is connected, then U is path-connected."* So: *"When U is compact, then (¥)"*: T F. *"When U is open, then (¥)"*: T F.

b Each fnc $f, g: \mathbb{R}_+ \to \mathbb{R}_+$ is *uniformly-continuous*. Then:
"Product $f \cdot g$ is unif-cts": T F.
"Composition $f \circ g$ is unif-cts": T F.
"The reciprocal $1/f$ is unif-cts": T F.

c Differentiable fncs $h_n: \mathbb{R} \to \mathbb{R}$ have $|h_1'()| \leqslant 1$, $|h_2'()| \leqslant 2$, $|h_3'()| \leqslant 3, \ldots$. Suppose we have *uniform convergence* $h_n \xrightarrow{\text{unif}} G$. Then *"G is unif-cts"*: T F.

d $f(t) := \int_{\exp(t)}^{\sin(t^3)} \sin\big(\sin(x)\big)\,\mathrm{d}x$, a calc1 oriented-integral.

Then $f'(t)=$ ....

[*Hint:* Chain rule and Fund. Thm of Calculus.]

Essay questions: Please write each essay triple–spaced.
Each essay starts a new page.

D2: With $\mathbf{J} := [4, 8]$, suppose fncs $G, H: \mathbf{J} \to [-5, 3]$ are each RI. Give a detailed proof that their product $\varphi := G \cdot H$ is RI, by showing that for each $\varepsilon > 0$ there exists $\delta > 0$ so that each partition P which is δ-small has $\mathsf{Osc}^{\varphi}(\mathsf{P}) \leqslant 1000\varepsilon$.

D3: With $\mathbf{J} := [4, 5]$, suppose each $h_n: \mathbf{J} \to [-2, 2]$ and $h_1 \geqslant h_2 \geqslant \ldots$; thus the pointwise limit $g := \lim_{n\to\infty} h_n$. exists. Provide a detailed *proof* or *CEX* to: *"If each h_n is Riemann integrable, then so is g."* T F

End of Class-D

D1:	___ ___	85pts
D2:	___ ___	85pts
D3:	___ ___	65pts
Total:	___ ___ ___	235pts