

**INSTRUCTIONS:** Books, notes, and electronic devices are not permitted. Write (1) **your full name**, (2) **1340/Exam 2**, (3) **lecture number/instructor name** and (4) **FALL 2019** on the front of your bluebook. Make a **grading table** for 4 problems and a total. Do all problems. **Start each problem on a new page.** **Box** your answers. A correct answer with incorrect or no supporting work may receive no credit, while an incorrect answer with relevant work may receive partial credit. **Justify your answers, show all work.**

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1. (28pts) The following problems are not related.

(a)(12pts) Suppose  $f(x) = \sin(x)$ , with domain  $0 \leq x \leq 4\pi$  and  $g(x) = x^{1/2}$ . Find  $(g \circ f)(x)$  and also state the domain in interval notation. Justify your answer.

(b)(12pts) Suppose that  $h(x) = \begin{cases} \frac{|x-3|}{x^2-9}, & \text{if } x < 3 \\ \frac{\sqrt{3x-5}}{12}, & \text{if } x > 3 \end{cases}$ , find the two-sided limit  $\lim_{x \rightarrow 3} h(x)$ . Show all work and justify your answer.

(c)(4pts) The function  $f(x) = \frac{3x+1}{\sqrt{4x^2+5}}$  has a *horizontal asymptote* at which choice below? (**No justification necessary** - Choose only one answer, copy down the entire answer.)

- (A)  $y=0$     (B)  $y=\frac{3}{2}$     (C)  $y=0$  and  $y=3/2$     (D)  $y=-3/2$  and  $y=1.5$     (E) None of these
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2. (24pts) The following problems are not related.

(a)(12pts) Use the Squeeze Theorem to evaluate the following limit:  $\lim_{x \rightarrow 1} (x-1)^2 \cos\left(\frac{1}{x-1}\right)$ . Show all work, explain your answer.

(b)(12pts) Find the limit  $\lim_{x \rightarrow 0} \frac{\sin(\pi x)}{\sin(5x)}$ . Justify your answer, show all work.

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**PROBLEMS #3 & #4 ON THE OTHER SIDE**

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3. (28pts) The following problems are not related.

(a)(12pts) Evaluate the limit:  $\lim_{x \rightarrow 4} \frac{\sqrt{6x+1} - 5}{x-4}$ . Show all work.

(b)(12pts) Suppose  $f(x) = \begin{cases} x^2 + x, & \text{if } x \neq 0 \\ \cos(x), & \text{if } x = 0 \end{cases}$ . (i)(6pts) Find the  $\lim_{x \rightarrow 0} f(x)$ . (ii)(6pts) Is  $f(x)$  continuous for all real  $x$ ?  
If not, classify the discontinuities of  $f(x)$ . Use limits to answer this question. Explain.

(c)(4pts) Which choice below would result in shifting the graph of  $y = s(t)$  one unit to the right and then reflecting it about the  $y$ -axis? (**No justification necessary** - Choose only one answer, copy down the entire answer.)

(A)  $y = -s(t) - 1$  (B)  $y = s(-(t+1))$  (C)  $y = s(-(t-1))$  (D)  $y = -s(t+1)$  (E)  $y = s(-t) - 1$

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4. (20pts) The following problems are not related.

(a)(12pts) Let  $q(t) = \begin{cases} kt^2 + 2, & \text{if } t \leq 3 \\ \frac{t^2 - 9}{t - 3}, & \text{if } t > 3 \end{cases}$ . Find the value of  $k$  that makes  $q(t)$  continuous at  $t = 3$ . Justify.

(b)(8pts) Suppose the function  $y = g(x)$  has horizontal asymptote  $y = 3$  and vertical asymptote  $x = -1$ , find all horizontal and vertical asymptotes of the function  $h(t) = -g(t-2)/3$ . Justify your answer.

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THE LIST OF APPM 1340 LECTURE NUMBERS FOR THE FRONT OF YOUR BLUE BOOK:

Lecture #	Instructor	Class Time	Class Location
150	BHAT	MWF 12-12:50	ECCR 135
160	BHAT	MWF 1-1:50	ECCR 135

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