INSTRUCTIONS: Books, notes, and electronic devices are **not** permitted. Write (1) **your full name**, (2) **1350/Exam 1**, (3) **lecture number/instructor name** and (4) **SPRING 2018** 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. The following problems are not related.

   (a)(10pts) Suppose $f(x) = \sqrt{x}$ and $g(x) = \sqrt{4 - x^2}$. Find $(g \circ f)(x)$ and express the domain of this function in interval notation.

   (b)(10pts) Suppose we know that the function $p(x)$ is an *even* function. Show that the function $q(x) = x^3 + \sin(x) + xp(x)$ is an *odd* function. Justify your answer.

   (c)(5pts) 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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2. The following problems are not related.

   (a)(10pts) Use the Squeeze Theorem to evaluate the following limit: $\lim_{x \to 1} (x - 1)^2 \sin\left(\frac{1}{x - 1}\right)$. Show all work, explain your answer.

   (b)(12pts) Suppose that $f(x) = \begin{cases} \frac{4x + 1}{2 - x}, & \text{if } x \leq 0 \\ x + \frac{1}{x}, & \text{if } x > 0 \end{cases}$, use limits to find all horizontal and vertical asymptotes of $f(x)$. Show all work.

PROBLEMS #3 & #4 ON THE OTHER SIDE

3. The following problems are not related.

(a)(12pts) Find the real number a so that the function $f(x) = \begin{cases} \dfrac{3\sin(1+x)}{1+x}, & \text{if } x \neq -1 \\ ax+8, & \text{if } x = -1 \end{cases}$ is continuous for all real numbers. Be sure to show that all three conditions of continuity have been satisfied.

(b)(12pts) The function $g(x) = \dfrac{x+10}{|x|+2}$ has two horizontal asymptotes. They are $y = 1$ and $y = -1$. Use a theorem from class to show that $g(x)$ crosses one of it's horizontal asymptotes on the interval $[-10, 0]$. Clearly explain your answer.

(c)(5pts) For which one of the 4 choices below is the following true: $\lim_{x\to 3} f(x) = -2$. (**No justification necessary** - *Choose only <u>one</u> answer, copy down the entire answer.*)

(A) $f(x) = \dfrac{-6\sin(\pi x/6)}{x}$ (B) $f(x) = \dfrac{-2(x-3)}{|x-3|}$ (C) $f(x) = \dfrac{-2x^2-3x+4}{x^2-1}$ (D) $f(x) = \begin{cases} \cos(\pi x/6)-2, & \text{if } x \leq 3 \\ 2, & \text{if } x > 3 \end{cases}$

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4. The following problems are not related.

(a)(12pts) For this problem, use the <u>*limit definition of the derivative*</u> to find the derivative of $f(x) = \dfrac{1}{\sqrt{x}}$, show all work.

(b) Consider the function $g(x) = \sqrt[3]{x^2-1}$ with derivative $g'(x) = \dfrac{2x}{3(x^2-1)^{2/3}}$.

(*i*)(6pts) Find the equation of the tangent line to $g(x) = \sqrt[3]{x^2-1}$ at the point $x = 3$. Simplify your answer.

(*ii*)(6pts) For what values of x is the function $g(x) = \sqrt[3]{x^2-1}$ *differentiable*? Justify your answer.

The list of Appm 1350 <u>Lecture Numbers/Instructor Names</u> for the front of your blue book:

Lecture #	Instructor	Class Time	Class Location
120	Susan Hallowell	MWF 9-9:50	ECCR 135
130	Sujeet Bhat	MWF 10-10:50	ECCR 200
150	Sujeet Bhat	MWF 12-12:50	FLMG 154
170	Susan Hallowell	MWF 2-2:50	FLMG 104
801	Sandra Williams	MWF 2-2:50	ECCR 131

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