

**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 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.**

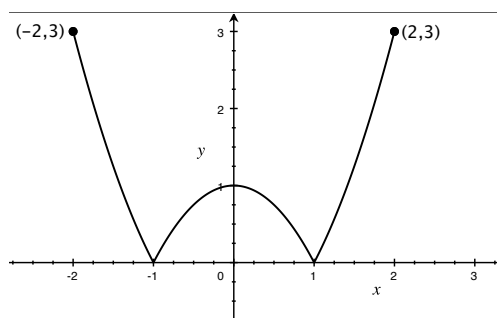
1. (28pts) The following problems are not related.

(a)(12pts) Suppose  $f(x) = \frac{1}{\sqrt{4-x^2}}$  and  $g(x) = \sqrt{x+3}$ . Find  $(f \circ g)(x)$  and express the domain of this function in interval notation.

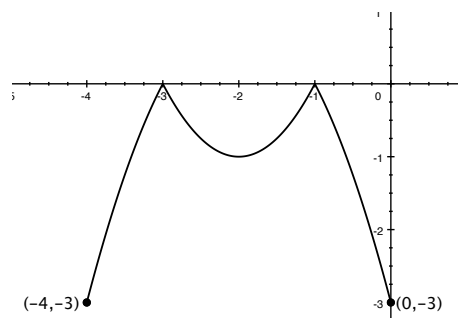
(b)(12pts) Suppose that  $h(x) = \begin{cases} \frac{x^2 - 4}{|x - 2|}, & \text{if } x < 2 \\ \frac{\sqrt{2x} - 10}{2}, & \text{if } x > 2 \end{cases}$ , find the two-sided limit  $\lim_{x \rightarrow 2} h(x)$ . Show all work and justify your answer.

(c)(4pts) Consider the graph of the function below labeled as  $A$ . If this function is  $y = f(x)$  then which of the following choices given below correctly represents the graph labeled as  $B$ ? **No justification necessary**- Choose only one answer, copy down the entire answer.)

- (A)  $y = -f(x) - 2$  (B)  $y = f(-x) - 2$  (C)  $y = -f(x + 2)$  (D)  $y = f(-x + 2)$  (E)  $y = f(-x) + 2$



(a) Graph A - the function  $y = f(x)$



(b) Graph B

Figure 1: Graphs for Problem 1(c)

2. (24pts) The following problems are not related.

(a)(12pts) Suppose  $4x + x^2 \leq 2g(x) + x^2 \leq 2x^4 - x^2 + 4$  for all  $x$  near 1, find  $\lim_{x \rightarrow 1} g(x)$ . Show all work, explain your answer. Clearly state any named theorems you are using.

(b)(12pts) Find the limit  $\lim_{x \rightarrow 0} \frac{\sin(3x) \sin(5x)}{x^2}$ . Justify your answer, show all work.

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

(a)(12pts) Evaluate the limit:  $\lim_{x \rightarrow 0} \frac{\sqrt{3+x} - \sqrt{3}}{x}$ . Show all work.

(b)(12pts) Consider the function  $f(x) = \frac{x^3 - x^2 - 2x}{(x+3)(x-2)}$ . (i)(9pts) Find the  $\lim_{x \rightarrow 2} f(x)$ . (ii)(3pts) Is  $f(x)$  continuous at  $x = 2$ ? If not, what type of discontinuity is at  $x = 2$ ? Justify your answers.

(c)(4pts) If  $\lim_{x \rightarrow a} f(x) = 2$  and  $\lim_{x \rightarrow a} g(x) = 6$  then which of the choices below is equal to  $\lim_{x \rightarrow a} [(f(x))^2 - 2f(x)g(x) + (g(x))^2]$ ?  
(No justification necessary - Choose only one answer, copy down the entire answer.)

- (A) 40            (B) -4            (C) 16            (D) 28            (E) None of these
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4. (20pts) The following problems are not related.

(a)(12pts) Find the real number  $a$  so that the function  $f(x) = \begin{cases} \frac{3\sin(x)}{x}, & \text{if } x \neq 1 \\ ax + 8, & \text{if } x = 1 \end{cases}$  is continuous at  $x = 1$ . Explain your answer.

(b)(8pts) Use the Intermediate Value Theorem to show that the  $x$ -coordinate of at least one of the intersection points where the cubic curve  $y = x^3 - 3x$  crosses the line  $y = 1$  is in the interval  $[0, 2]$ . Explain your answer and be sure to verify that the requirements of the Intermediate Value Theorem have been satisfied.

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THE LIST OF APPM 1350 LECTURE NUMBERS/INSTRUCTOR NAMES FOR THE FRONT OF YOUR BLUE BOOK:

Lecture #	Instructor	Class Time	Class Location
120	Susan HALLOWELL	MWF 9-9:50	FLMG 104
130	Sujeet BHAT	MWF 10-10:50	ECCR 200
150	Sujeet BHAT	MWF 12-12:50	ECCR 1B51
170	Sandra WILLIAMS	MWF 2-2:50	ECCR 108

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