INSTRUCTIONS: Books, notes, and electronic devices are **not** permitted. Write (1) **your name**, (2) **1350/Exam 1**, (3) **lecture number/instructor name** and (4) **SPRING 2016** on the front of your bluebook. Also make a **grading table** with room for 4 problems and a total score. **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)(7 pts) Suppose $a(x) = \sqrt{x} + x^2$ and $b(x) = 2x - x^2$ then what is the domain of the function $y = a(x)/b(x)$? Give your answer in interval notation.

   (b)(7 pts) Suppose $n(x) = x^2 + 4x + 4$ and $m(x) = \sqrt{x}$, find $(m \circ n)(x)$ and sketch the graph of the composition.

   (c)(7 pts) 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.

   (d)(7 pts) Suppose $f(x)$ is an odd function such that $\lim_{x\to 5^-} f(x) = c$, where c is some nonzero constant. Which of the following five limits given below is/are equal to $-c$? [Clearly write down your answer(s) in your bluebook, no justification necessary.]

   $$(i)\lim_{x\to 5^+} f(x) \quad (ii)\lim_{x\to -5^+} f(x) \quad (iii)\lim_{x\to -5^-} f(x) \quad (iv)\lim_{x\to +5} f(x) \quad (v)\lim_{x\to -5} f(x)$$

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2. Evaluate the following limits, (please do not use l'Hospital's Rule) remember to show all work.

   (a)(7 pts) $\lim_{x\to\infty} \dfrac{x^{-1} + x^{-4}}{x^{-2} - x^{-3}}$ (b)(7 pts) $\lim_{\theta\to 0} \dfrac{\cos(\theta) - 1}{\sin(\theta)}$ (c)(7 pts) $\lim_{x\to 2} \dfrac{x^2 + x - 6}{|x-2|}$ (d)(7 pts) $\lim_{x\to 4} \dfrac{1}{-4 - x}$

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3. The following problems are not related, remember justify your answers and cite any theorems you use.

   (a)(8 pts) Let $q(t) = \begin{cases} kt^2 + 2, & \text{if } t \le 3 \\ \dfrac{t^2 - 9}{t - 3}, & \text{if } t > 3 \end{cases}$. Find the value of k that makes $q(t)$ *continuous* on $(-\infty, \infty)$. Justify.

   (b)(7 pts) Does the equation $2\sin(x) = 3 - 2x$ have a solution? Why or why not? Justify your answer.

   (c)(7 pts) Is the function $f(x) = \begin{cases} \sqrt{-x}\left[1 + \cos^2(1/x)\right], & \text{if } x < 0 \\ 0, & \text{if } x = 0 \end{cases}$ *left continuous* at $x = 0$? Why or why not?

PROBLEM #4 ON THE OTHER SIDE

4. The following problems are not related, remember to show all work and justify your answers.

(a)(8 pts) If $y = \sqrt{x+5}$, find dy/dx using the limit definition of the derivative. Simplify your answer.

(b)(7 pts) Suppose $f(x) = \begin{cases} x^2 + x, & \text{if } x \leq 0 \\ \sin(x), & \text{if } x > 0 \end{cases}$, is $f(x)$ continuous for all x? Why or why not? Is $f(x)$ *differentiable* at the point $x = 0$? (Use the limit definition of the derivative for this problem). Justify your answer.

(c)(7 pts) Explorers on a small airless planet used a spring gun to launch a ball bearing vertically upward from the surface at a launch velocity of 15 m/sec. The acceleration of gravity at the planet's surface is assumed to be k m/sec^2 and the explorers expect the ball bearing to reach a height of $s(t) = 15t - (1/2)kt^2$ meters t seconds after the launch. The explorers determined that the ball bearing was at rest 20 seconds after being launched. What is the acceleration of gravity, k, at the planet surface?

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

Lecture #	Instructor	Class Time	Location
120	Murray COX	MWF 9-9:50	EDUC 220
130	Brendan FRY	MWF 10-10:50	ECCR 200
150	Brendan FRY	MWF 12-12:50	FLMG 102
170	Sujeet BHAT	MWF 2-2:50	ECCR 245
180	Sujeet BHAT	MWF 3-3:50	ECCR 116
340R	Ann DEFRANCO	MWF 8:30-9:20	WVN 181A
801	Sandra WILLIAMS	MWF 2-2:50	LRVN N101

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