INSTRUCTIONS: Books, notes, and electronic devices are **not** permitted. Write (1) **your name**, (2) **1350/Test 1**, (3) **lecture number/instructor name** and (4) **FALL 2014** 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. **SHOW ALL WORK! JUSTIFY ALL YOUR ANSWERS!**

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1. For this problem, suppose $f(x) = \sqrt{x-6}$ and $g(x) = |2x-1|$.

   (a) (6 pts) Write down the domain and range of $(f \circ g)(x)$. Show all work.

   (b) (6 pts) Evaluate the limit: $\lim_{x \to 0.5} \dfrac{g(x)}{1-2x}$.

   (c) (6 pts) Suppose we let $h(x) = \begin{cases} f(x), \text{if } x > 6 \\ g(x), \text{if } x \leq 6 \end{cases}$, are there any values of x for which $h(x)$ is *not* continuous? Justify your answer. What type of discontinuities does $h(x)$ have (i.e. *jump*, *removable*, or *infinite*), if any?

   (d) (7 pts) Use the limit definition of the derivative to find $f'(106)$.

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2. (a)(7 pts) Evaluate the limit or explain why it doesn't exist: $\lim_{x \to -3} \dfrac{x^2-9}{2x^2+4x-6}$

   (b)(6 pts) Evaluate the limit or explain why it doesn't exist: $\lim_{x \to 1^-} \dfrac{x^2-9}{2x^2+4x-6}$

   (c)(6 pts) Find all horizontal asymptotes of $f(x) = \dfrac{x^2-9}{2x^2+4x-6}$. Justify your answer, show all work.

   (d)(6 pts) Find and classify all the discontinuities of $f(x) = \dfrac{x^2-9}{2x^2+4x-6}$, if any. Justify your answer.

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3. (a)(10 pts) Given the function $f(x) = \begin{cases} x^3 \cos\left(\dfrac{1}{x^2}\right), & \text{if } x \neq 0 \\ a-4, & \text{if } x = 0 \end{cases}$, find the value of the parameter a that makes $f(x)$ continuous for every real number.

   (b)(5 pts) Evaluate the following limit if possible: $\lim_{x \to 0} \left(x^3 + 11\cos(2x)\right)$.

   (c)(5 pts) If $b(x) = x^3 + 11\cos(2x)$, show that there is at least one solution to the equation $b(x) = 0$.

   (d)(5 pts) Evaluate $\lim_{\theta \to 0} \dfrac{1-\cos(\theta)}{\theta^2}$. (*Hint:* recall that $\sin^2(\theta) + \cos^2(\theta) = 1$ for any real number θ).

PROBLEM #4 ON THE OTHER SIDE

4. (a)(10 pts) Use the limit definition of the derivative to find the slope of $f(x) = 2x^2 - 13x + 5$ at any point x.

(b)(5 pts) Find an equation of the tangent line to the parabola $f(x) = 2x^2 - 13x + 5$ whose slope is $m = -9$.

(c)(5 pts) If $s(t) = 2t^2 - 13t + 5$ for $t \geq 0$ describes the position of an object (in feet) at time t, find the average velocity of the object from $t = 1$ second to $t = 2$ seconds.

(d)(5 pts) Note that if $g(x) = x^2$, then $g'(x) = 2x$. Now, suppose L is the tangent line to $y = g(x)$ at the point $(1, 1)$. The *angle of inclination* of L is the angle ϕ that L makes with the positive x-axis, find $\tan(\phi)$.

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

Lecture #	Instructor	Class Time	Location
110	Ryan CROKE	MWF 8-8:50	BESC 180
120	Ryan CROKE	MWF 9-9:50	ECCR 200
130	Murray COX	MWF 10-10:50	ECCR 245
150	Sujeet BHAT	MWF 12-12:50	ECCR 200
160	James CURRY	MWF 1-1:50	ECCR 1B40
170	Sujeet BHAT	MWF 2-2:50	ECCR 265
180	Jonathan KISH	MWF 3-3:50	EKLC 1B20
594R	Jonathan KISH	MWF 1-1:50	ANDS N103

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