

INSTRUCTIONS: Books, notes, and electronic devices are not permitted. Write (1) **your name**, (2) **1350/Final**, (3) **lecture number/instructor name** and (4) **FALL 2014** on the front of your bluebook. Also make a **grading table** with room for 6 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! SIMPLIFY YOUR ANSWERS AS MUCH AS POSSIBLE!**

1. The following parts are not related:

(a)(5 pts) Evaluate the limit $\lim_{x \rightarrow \infty} \cosh(x)^{1/x}$

(b)(5 pts) Evaluate the limit $\lim_{x \rightarrow 0^+} [\ln(\sin(x)) - \ln(x)]$

(c)(7 pts) Prove that $\lim_{x \rightarrow 0} x^4 \cos\left(\frac{2}{x}\right) = 0$. Justify your answer.

(d)(8 pts) Suppose $f(x) = \begin{cases} x^2, & x \leq 2 \\ 4, & x > 2 \end{cases}$. Use the limit definition of the derivative to determine whether or not $f(x)$ is differentiable at the point $x = 2$. You may not use L'Hospital's Rule for this problem. Justify your answer.

2. The following problems are not related:

(a)(5 pts) Find the derivative of $y = \ln(\arctan(x))$.

(b)(5 pts) Find $f'(x)$ if $f(x) = \int_{2x}^{10} \sin^{-1}(\theta) d\theta$.

(c)(7 pts) Use the Intermediate Value Theorem to show that there is a root to the equation $2^x + x = 0$. Justify your answer.

(d)(8 pts) A kite 100 ft above the ground moves horizontally at a speed of 8 ft/s. At what rate is the angle between the string and the horizon changing when 200 ft of string has been let out?

3. The following problems are not related:

(a)(5 pts) Find the instantaneous rate of change of $f(x) = \frac{\tanh(x)}{x}$ with respect to x .

(b)(5 pts) Find $\frac{dy}{dx}$ given $y = x^{\cos(x)}$.

(c)(7 pts) Use logarithmic differentiation to find y' if $y = \frac{e^x(x+1)^3}{\sqrt{\sec(x)}}$.

(d)(8 pts) Classify all discontinuities of $f(x) = \frac{2x^2 + 12x}{x|x+6|}$ as either *jump*, *removable* or *infinite*. Justify your answers.

4. The following problems are not related:

(a)(5 pts) Find the following antiderivative $\int (x^5 + 5^x) dx$

(b)(5 pts) Evaluate the definite integral $\int_0^8 \frac{x}{\sqrt{1+x}} dx$

(c)(7 pts) A curve passes through the point $(\ln(2), 8)$ and has the property that the slope of the curve at every point P is 2 times the y -coordinate of P . What is the equation of the curve?

(d)(8 pts) Find the linear approximation of $f(x) = \sqrt[3]{1+x}$ at $a = 0$ and use it to approximate $\sqrt[3]{1.1}$

5. The following problems are not related.

(a)(5 pts) Evaluate the integral $\int \frac{e^x}{e^x + 1} dx$.

(b)(5 pts) Evaluate the definite integral $\int_0^{\pi/2} \frac{\cos(x)}{1 + \sin^2(x)} dx$.

(c)(7 pts) If $f(x) = 3 + x + e^x$ find $(f^{-1})'(4)$.

(d)(8 pts) Use the Mean Value Theorem to show that there exists a number c in $(-1, 1)$ such that $e^c = \sinh(1)$.

6. For this problem we have $f(x) = \frac{x^2 - 4}{x^2 + 4}$, $f'(x) = \frac{16x}{(x^2 + 4)^2}$, and $f''(x) = \frac{16(4 - 3x^2)}{(x^2 + 4)^3}$

(a)(8 pts) Find the intervals of concavity and the inflection points of $f(x)$.

(b)(8 pts) On what intervals is $f(x)$ increasing? decreasing? Find and classify all local extrema of $f(x)$.

(c)(4 pts) Find all Vertical and Horizontal Asymptotes of $f(x)$.

(d)(3 pts) Is $f(x)$ an even function an odd function or neither? Why or why not? Justify your answer.

(e)(2 pts) Sketch the graph of $f(x)$ (Clearly label all the axes, intercepts, asymptote and local extrema).

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