

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 2021** on the first page of your test. 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.** You must start uploading your test to Gradescope by 9:01pm.

Write the **honor code statement** given in the box below on the **first page** of your test and **sign** and **date it**.

On my honor, as a University of Colorado Boulder student, I have neither given nor received unauthorized assistance on this work. Signature: _____ Date: _____

1. (24pts) The following parts of this problem are not related.

(a)(12pts) Given the functions $f(x) = \frac{1}{x^2 - 3}$ and $g(x) = \sqrt{x + 1}$, find the composition $(f \circ g)(x)$ and state the domain using interval notation.

(b)(12pts) Evaluate the limit: $\lim_{x \rightarrow 1} \frac{x^2 + 4x - 5}{x^2 - x}$. Show all work.

2. (28pts) Start this problem on a **new** page. The following parts of this problem are not related.

(a)(12pts) Evaluate the limit: $\lim_{x \rightarrow 4} \frac{\sqrt{6x + 1} - 5}{x - 4}$. Show all work.

(b)(12pts) Suppose $f(x) = \begin{cases} x^2 + x, & \text{if } x \neq 0 \\ \cos(x), & \text{if } x = 0 \end{cases}$. (i)(6pts) Find the $\lim_{x \rightarrow 0} f(x)$. (ii)(6pts) Is $f(x)$ continuous for all real x ? If not, classify the discontinuities of $f(x)$. Be sure to show that all three conditions of continuity have been satisfied and justify your answer.

(c)(4pts) The function $f(x) = \frac{3x + 1}{\sqrt[3]{8x^3 + 5}}$ has a *horizontal asymptote* at which choice below? (**No justification necessary** - Choose only one answer, copy down the entire answer.)

- (A) $y = 0$ (B) $y = \frac{3}{2}$ (C) $y = 0$ and $y = 3/2$ (D) $y = -3/2$ and $y = 3/2$ (E) None of these

3. (24pts) Start this problem on a **new** page. The following parts of this problem are not related.

(a)(12pts) Use the Squeeze Theorem to evaluate the following limit: $\lim_{x \rightarrow 0} x^4 \cos\left(\frac{\pi - 4}{x^2}\right)$.

(b)(12pts) Find $\lim_{x \rightarrow 0} \frac{\sin(3x)}{5x}$. Show all work and justify your answer.

4. (24pts) Start this problem on a **new** page.

(a)(10pts) Use one-sided limits to find $\lim_{x \rightarrow 3} \frac{|x - 3|}{x^3 - 3x^2}$. Show all work.

(b)(10pts) Suppose $f(x) = \frac{|x - 3|}{x^3 - 3x^2}$. (i)(5pts) Find the limit $\lim_{x \rightarrow 0} f(x)$. Show all work. (ii)(5pts) Is $f(x)$ continuous for all real x ? If not, classify the discontinuities of $f(x)$. Explain.

(c)(4pts) The function $g(x) = \begin{cases} \frac{|x - 3|}{x^3 - 3x^2}, & \text{if } x > 2, \\ \frac{\sqrt{6x + 1} - 5}{x - 4}, & \text{if } x \leq 2, \end{cases}$ has a *vertical asymptote* at which choice below?

(No justification necessary - Choose only one answer, copy down the entire answer.)

(A) $x=0, x=3$ and $x=4$ (B) $x=0$ (C) $x=3$ and $x=4$ (D) $x=2$ (E) None of these

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

Lecture #	Instructor	Class Time	Lecture #
130	Tahra EISSA	MWF 10:20-11:10	130
150	Sujeet BHAT	MWF 12:40-1:30	150
170	Sujeet BHAT	MWF 3-3:50	170

— END —
(STAY SAFE.)