

INSTRUCTIONS: Books, notes, and electronic devices are not permitted. Write (1) **your full name**, (2) **1340/Exam 3**, (3) **lecture number/instructor name** and (4) **FALL 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. (24pts) The following problems are not related. Show all work.

(a)(12pts) Use the *Quotient Rule* to find $f'(x)$ if $f(x) = \frac{x^3}{1-x^2}$. Simplify your answer.

(b)(12pts) If $y = \sec^4(\pi\theta)$ find $dy/d\theta$. Simplify your answer.

2. (28pts) The following problems are not related. Show all work.

(a)(12pts) Suppose $y = f(x)$, use *implicit differentiation* to find y' if $\cos(xy) = 1 - \sin(y)$.

(b)(12pts) Find the equation of the *tangent line* to $y = x^2 - x^4$ at the point $(1, 0)$. Simplify your answer.

(c)(4pts) Which of the choices below is equivalent to the limit $\lim_{x \rightarrow \pi/3} \frac{\cos(x) - 0.5}{x - \pi/3}$? **Choose only one answer.** *No justification necessary, copy down the entire answer. If you do not copy down the entire answer, points will be deducted.*

(A) $\frac{0}{0}$

(B) $+\infty$

(C) $\frac{1}{2}$

(D) $-\frac{\sqrt{3}}{2}$

(E) None of these

PROBLEMS #3 & #4 ON THE OTHER SIDE

3. (20pts) The following problems are not related. Show all work.

(a)(10pts) For what value(s) of $x \in [0, 2\pi]$ does $f(x) = x + 2 \sin(x)$ have *horizontal tangent*?

(b) The position function of a particle is given by $s(t) = t^3 - 6t^2 + 9t$ where $t \geq 0$ is in seconds and distance is in feet. (i)(5pts) When is the particle at rest? (ii)(5pts) What is the *total distance* traveled by the particle in the first 2 seconds? Simplify your answer.

4. (28pts) The following problems are not related. Show all work.

(a)(12pts) Suppose $\cot(g'(x)) = x\pi^2 + 1$, find $g''(0)$.

(b)(12pts) If $f(x) = \begin{cases} \frac{x}{2}, & \text{if } x < 2 \\ \sqrt{2x}, & \text{if } x \geq 2 \end{cases}$, find $f'(x)$. Is $f(x)$ *differentiable* for all x ? Explain.

(c)(4pts) Suppose the equation of the tangent line to the function $f(x) = ax^2 + bx$ at $(1, 1)$ is $y = 3x - 2$, then a and b are equal to which choice below? **Choose only one answer.** *No justification necessary, copy down the entire answer. If you do not copy down the entire answer, points will be deducted.*

(A) $a = 1, b = 1$ (B) $a = 2, b = -1$ (C) $a = 3, b = 4$ (D) $a = -3, b = 4$ (E) None of these

THE LIST OF APPM 1340 LECTURE NUMBERS FOR THE FRONT OF YOUR BLUE BOOK:

Lecture #	Instructor	Class Time	Class Location
150	BHAT	MWF 12-12:50	ECCR 135
160	BHAT	MWF 1-1:50	ECCR 135

— END —