

Print Name _____

APPM 1350

Exam 2

Summer 2016

On the front of your bluebook, please write: a grading key, your name, student ID, your lecture number and instructor. This exam is worth 100 points and has 5 questions on both sides of this paper.

- Submit this exam sheet with your bluebook. However, nothing on this exam sheet will be graded. Make sure all of your work is in your bluebook.
 - **Show all work and simplify your answers!** Answers with no justification will receive no points.
 - Please begin each problem on a new page.
 - No notes or papers, calculators, cell phones, or electronic devices are permitted.
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1. The following parts are not related:

(a) (9 pts each) Find $\frac{dy}{dx}$ given:

i. $y = \frac{\tan x + 1}{\csc x}$

ii. $x^2 = \sqrt{xy} + 2y^2$

(b) (9 pts) A function f and its derivative have values shown in Table 1 below.

Let $g(x) = -x^2 f(2x)$. Use the values in the table to compute $g'(1)$.

Table 1

x	$f(x)$	$f'(x)$
0	1	2
1	1	-2
2	3	-1

2. (14 pts) A balloon is rising at a constant speed of 2 meters per second. A girl is cycling along a straight road at a constant speed of 1 meter per second. When she passes under the balloon, it is 3 meters above her. How fast is the distance between the balloon and the girl increasing 3 seconds later?
3. The local dice company has a machine that creates six-sided dice with a volume of $V(x) = (2x - 1)^3$.
- (a) (9 pts) Use a linearization to compute $V(2.01)$.
- (b) (9 pts) If a particular die is made with a value of $x = 5$ mm with maximum error of 0.01 mm in the measurement of x , compute the percent error in the volume.

TWO MORE ON THE OTHER SIDE

4. Answer the following.

Given $f(x) = \frac{-x^2 + 1}{(x - 2)^2}$ with, $f'(x) = \frac{4x - 2}{(x - 2)^3}$ and, $f''(x) = \frac{-8x - 2}{(x - 2)^4}$, where the intercepts of f are $(1, 0)$, $(-1, 0)$, and $\left(0, \frac{1}{4}\right)$, find the following for f .

- (a) (10 pts) Find all asymptote(s) for f . Justify your answer(s) using the appropriate limits.
 - (b) (4 pts) Find the intervals of increase and decrease for the function f . Justify your answer(s).
 - (c) (4 pts) Find the local maximum and minimum values for the function f . Justify your answer(s).
 - (d) (7 pts) Find the intervals of concave up and down and the inflection points for the function f . Justify your answer(s).
 - (e) (6 pts) Use parts (a) - (d) to sketch the graph of f . LABEL the asymptote(s), maximum(s), minimum(s), and inflection point(s) on your graph.
5. (a) (5 pts) State the mean value theorem.
- (b) (5 pts) Suppose that $f(x)$ is an even function and is differentiable everywhere. Use the mean value theorem to show that for every positive number b , there exists a number c in $(-b, b)$ such that $f'(c) = 0$.

END