MA 113 Calculus I   Fall 2017
Exam 2   Tuesday, 17 October 2017

Name: ───────────────────

Section: ─────────────────

Last 4 digits of student ID #: ───────
This exam has 12 multiple choice questions
(five points each) and 4 free response ques-
tions (ten points each). Additional blank sheets
are available if necessary for scratch work. No
books or notes may be used. Turn off your
cell phones and do not wear ear-plugs during
the exam. You may use a calculator, but not
one which has symbolic manipulation capa-
bilities.
On the multiple choice problems:

- Select your answer by placing an X in
  the appropriate square of the multiple
  choice answer box on the front page of
  the exam.

- Carefully check your answers. No credit
  will be given for answers other than those
  indicated on the *multiple choice answer
  box*.

On the free response problems:

- Clearly indicate your answer and the
  reasoning used to arrive at that answer
  *(unsupported answers may not receive
  credit)*,

- Give exact answers, rather than deci-
  mal approximations to the answer (un-
  less otherwise stated).

Each free response question is followed by
space to write your answer. Please write your
solutions neatly in the space below the ques-
tion.

Multiple Choice Answers

Question					
1	A	B	C	D	E
2	A	B	C	D	E
3	A	B	C	D	E
4	A	B	C	D	E
5	A	B	C	D	E
6	A	B	C	D	E
7	A	B	C	D	E
8	A	B	C	D	E
9	A	B	C	D	E
10	A	B	C	D	E
11	A	B	C	D	E
12	A	B	C	D	E

Exam Scores

Question	Score	Total
MC		60
13		10
14		10
15		10
16		10
Total		100

1. Find $\lim\limits_{t \to 0} \dfrac{\tan(4t)}{6t}$.

(A) $\dfrac{1}{3}$

(B) $\dfrac{2}{3}$

(C) $\dfrac{3}{4}$

(D) $\dfrac{3}{2}$

(E) None of the above

2. Suppose that $h(x) = f(g(x))$. Suppose that $g(3) = 4$, $h'(3) = 12$, and $g'(3) = 6$. Find $f'(4)$.

(A) 1

(B) 2

(C) 3

(D) 4

(E) 6

3. Let $f(x) = e^{3x}\sqrt{x}$. Find $f'(1)$.

    (A) $\dfrac{7}{2}e^3$

    (B) $\dfrac{9}{2}e^3$

    (C) $\dfrac{11}{2}e^3$

    (D) $\dfrac{13}{2}e^3$

    (E) $\dfrac{15}{2}e^3$

4. Let $f(\theta) = \tan(\theta)$. Find $f''(\theta)$.

    (A) $\cot(\theta)$

    (B) $\sec^3(\theta) + \sec(\theta)\tan^2(\theta)$

    (C) $2\sec(\theta)\tan^2(\theta)$

    (D) $2\sec^2(\theta)\tan(\theta)$

    (E) $2\sec(\theta)\tan(\theta)$

Record the correct answer to the following problems on the front page of this exam.

5. Let $f(x) = \dfrac{2x^2 - 5x + 3}{2x - 1}$. Find $f'(2)$.

(A) $\dfrac{4}{9}$

(B) $\dfrac{5}{9}$

(C) $\dfrac{7}{9}$

(D) $\dfrac{8}{9}$

(E) $\dfrac{11}{9}$

6. Find the slope of the tangent line to the graph of $y = \left(\dfrac{1}{2x - 1} \right)^2$ at $x = 2$.

(A) $\dfrac{-2}{27}$

(B) $\dfrac{-4}{27}$

(C) $\dfrac{-4}{9}$

(D) $\dfrac{-2}{9}$

(E) $\dfrac{-2}{3}$

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7. Let $f(x) = 4e^{-x^2} + \cos(5x)$. Find $f'(x)$.

    (A) $4e^{-x^2} - 5\sin(5x)$

    (B) $-8xe^{-x^2} + 5\cos(5x)$

    (C) $4e^{-x^2} + 5\sin(5x)$

    (D) $4e^{-x^2} + 5\cos(5x)$

    (E) $-8xe^{-x^2} - 5\sin(5x)$

8. Let $f(x) = \ln(\sqrt{x^4 + 3x^2 + 14})$. Find $f'(1)$.

    (A) $\dfrac{5}{\sqrt{18}}$

    (B) $\dfrac{5}{18}$

    (C) $\dfrac{1}{2\sqrt{18}}$

    (D) $\dfrac{1}{36}$

    (E) $\dfrac{1}{\sqrt{18}}$

9. Suppose that $f(u) = u^3$ and $u = \tan(2\theta) + \cos(\theta)$. Find $\dfrac{df}{d\theta}$.

(A) $3(\sec^2(2\theta) - \sin(\theta))^2$

(B) $3(\tan(2\theta) + \cos(\theta))^2 (2\sec^2(2\theta) - \sin(\theta))$

(C) $3(\tan(2\theta) + \cos(\theta))^2 (2\sec^2(2\theta) + \sin(\theta))$

(D) $3(2\sec^2(2\theta) - \sin(\theta))^2$

(E) $3(\tan(2\theta) + \cos(\theta))^2 (\sec^2(\theta) - \sin(\theta))$

10. Suppose that the position of a particle at time t seconds is $p(t) = (3t - 4)(t + 2)$ meters to the right of the origin. At what time is the velocity equal to 15 meters per second?

(A) $t = \dfrac{5}{6}$

(B) $t = \dfrac{7}{6}$

(C) $t = \dfrac{9}{6}$

(D) $t = \dfrac{11}{6}$

(E) $t = \dfrac{13}{6}$

11. Suppose that $g(x)$ is the inverse function of $f(x)$. (Recall this means that $f(g(x)) = g(f(x)) = x$.) Suppose that $f(3) = 8$ and $f'(3) = 4$. Then compute $f'(3)g'(8)$.

   (A) $\dfrac{1}{4}$

   (B) $\dfrac{1}{3}$

   (C) 1

   (D) $4 \cdot 3$

   (E) Cannot be determined with the given information.

12. The volume of a cube is changing at a rate of 120 cubic meters per second when the side length is 2 meters. At what rate is the length of the side changing at this moment?

   (A) 15 meters per second

   (B) 12 meters per second

   (C) 10 meters per second

   (D) 8 meters per second

   (E) None of the above

13. Consider the equation $x^3 + y^3 + 5xy = 65$.

    (a) Find $\dfrac{dy}{dx}$ in terms of x and y.

    (b) Find the equation of the tangent line at the point $(3, 2)$.

14. Use the limit definition of the derivative to compute the derivative of the function $y = \sqrt{x}$.
    (No credit will be given for using a differentiation formula.)

15. A ladder 17 meters long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 3 meters per second, how fast is the top of the ladder sliding down the wall when the bottom of the ladder is 8 meters from the wall?

16. A man of height 1.8 meters is standing by a 4 meter lamppost. He walks briskly away from the lamppost with a speed of 2 meters per second along a straight path. How fast is the length of his shadow growing?