

MA 16500
EXAM 2 INSTRUCTIONS
VERSION 01
October 23, 2014

Your name _____ Your TA's name _____
Student ID # _____ Section # and recitation time _____

1. You must use a #2 pencil on the scantron sheet (answer sheet).
2. Check that the cover of your question booklet is GREEN and that it has VERSION 01 on the top. Write 01 in the TEST/QUIZ NUMBER boxes and blacken in the appropriate spaces below.
3. On the scantron sheet, fill in your TA's name (NOT the lecturer's name) and the course number.
4. Fill in your NAME and PURDUE ID NUMBER, and blacken in the appropriate spaces.
5. Fill in the four-digit SECTION NUMBER.
6. Sign the scantron sheet.
7. Blacken your choice of the correct answer in the spaces provided for each of the questions 1-12. Do all your work on the question sheets. Show your work on the question sheets. Although no partial credit will be given, any disputes about grades or grading will be settled by examining your written work on the question sheets.
8. There are 12 questions, each worth 8 points. The maximum possible score is $8 \times 12 + 4$ (for taking the exam) = 100 points.
9. NO calculators, electronic device, books, or papers are allowed. Use the back of the test pages for scrap paper.
10. After you finish the exam, turn in BOTH the scantron sheets and the exam booklets.
11. If you finish the exam before 7:25, you may leave the room after turning in the scantron sheets and the exam booklets. If you don't finish before 7:25, you should REMAIN SEATED until your TA comes and collects your scantron sheets and exam booklets.

Exam Policies

1. Students must take pre-assigned seats and/or follow TAs' seating instructions.
2. Students may not open the exam until instructed to do so.
3. No student may leave in the first 20 min or in the last 5 min of the exam.
4. Students late for more than 20 min will not be allowed to take the exam; they will have to contact their lecturer within one day for permission to take a make-up exam.
5. After time is called, the students have to put down all writing instruments and remain in their seats, while the TAs will collect the scantrons and the exams.
6. Any violation of the above rules may result in score of zero.

Rules Regarding Academic Dishonesty

1. You are not allowed to seek or obtain any kind of help from anyone to answer questions on the exam. If you have questions, consult only your instructor.
2. You are not allowed to look at the exam of another student. You may not compare answers with anyone else or consult another student until after you have finished your exam, handed it in to your instructor and left the room.
3. You may not consult notes, books, calculators. You may not handle cell phones or cameras, or any electronic devices until after you have finished your exam, handed it in to your instructor and left the room.
4. Anyone who violates these instructions will have committed an act of academic dishonesty. Penalties for academic dishonesty can be very severe and may include an F in the course. All cases of academic dishonesty will be reported immediately to the Office of the Dean of Students.

I have read and understand the exam policies and the rules regarding the academic dishonesty stated above:

STUDENT NAME: _____

STUDENT SIGNATURE: _____

Questions

1. Suppose that $F(x) = f(g(x)^2)$ and that the functions f and g satisfy the following conditions:

$$f'(1) = 4, f'(2) = 3, f'(4) = 2$$

$$g(1) = 3, g(2) = 2, g(4) = 1$$

$$g'(1) = 2, g'(2) = 3, g'(4) = 4$$

Find $F'(2)$.

- A. 16
- B. 24
- C. 36
- D. 48
- E. 72

2. Find the exact values for

(a) $\cos(2 \arcsin(\frac{1}{2}))$

(b) $\tan \theta$ when $\sec \theta = \frac{13}{5}$ and $-\pi/2 < \theta < 0$.

A. (a) $\frac{1}{\sqrt{3}}$ (b) $\frac{5}{13}$

B. (a) $\frac{1}{\sqrt{3}}$ (b) $\frac{13}{12}$

C. (a) $-\frac{1}{2}$ (b) $-\frac{12}{5}$

D. (a) $\frac{1}{2}$ (b) $-\frac{5}{12}$

E. (a) $\frac{1}{2}$ (b) $-\frac{12}{5}$

3. Find the derivative $\frac{dy}{dx}$ when $y = x^{\sin x}$.

A. $\frac{dy}{dx} = (\sin x) \cdot x^{\sin x - 1}$

B. $\frac{dy}{dx} = (\ln x) \cdot x^{\sin x} \cdot \cos x$

C. $\frac{dy}{dx} = (\sin x) \cdot x^{\sin x - 1} + (\ln x) \cdot x^{\sin x} \cdot \cos x$

D. $\frac{dy}{dx} = x^{\sin x} \cdot (\ln x + \sin x)$

E. $\frac{dy}{dx} = x^{\sin x} \cdot (\cos x + \frac{1}{x})$

4. Find the slope of the tangent to the curve given by the equation

$$\tan(xy) = 8y^2 - \sin x$$

at a point $(x, y) = (\frac{\pi}{2}, \frac{1}{2})$.

- A. $\frac{1}{4}$
- B. $\frac{1}{8-\pi}$
- C. ∞
- D. $\frac{2-\pi}{4+\pi}$
- E. $\frac{\pi}{2-\pi}$

5. Find an approximate value of $(8.03)^{4/3}$ by using the linear approximation of the function $f(x) = x^{4/3}$ at $a = 8$.

- A. $\frac{402}{25}$
- B. $\frac{481}{30}$
- C. $\frac{161}{10}$
- D. $\frac{643}{40}$
- E. $\frac{1603}{100}$

6. The position of a particle is given as a function of time in seconds by the formula $f(t) = t^3 - 9t^2 + 24t$.

Find the total distance travelled by the particle during the first three seconds.

- A. 16.
- B. 18
- C. 20
- D. 22
- E. 24

7. Find the formula for $\tan(2 \sin^{-1} x)$.

- A. $\frac{2x\sqrt{1-x^2}}{1-2x^2}$
- B. $\frac{x\sqrt{1-x^2}}{1-x^2}$
- C. $2x\sqrt{1-x^2}$
- D. $1-2x^2$
- E. $\frac{x}{\sqrt{1-x^2}}$

HINT: The double angle formula for the tangent is given by the following

$$\tan(2\theta) = \frac{\sin(2\theta)}{\cos(2\theta)} = \frac{2 \sin \theta \cos \theta}{\cos^2 \theta - \sin^2 \theta}$$

8. Let $f(x) = \sinh(\cos x) - \cosh(\sin x)$.

Find the exact value of $f'(\pi/2)$.

A. $\frac{e-e^{-1}}{2}$

B. -1

C. $\frac{e}{2}$

D. $-\frac{1}{2}$

E. $\frac{e+e^{-1}}{2}$

9. A street light is mounted at the top of a 15-ft-tall pole. A man 6 ft tall walks away from the pole along a straight path. The tip of his shadow is moving at the speed of 5 ft/s when he is 40 ft away from the pole. How fast is the man walking at that instant ?

- A. 3 ft/s
- B. 4 ft/s
- C. 5 ft/s
- D. $\frac{3}{40}$ ft/s
- E. $\frac{1}{8}$ ft/s

10. A paper cup has the shape of a reversed circular cone, which has a radius of 8 cm at the top and whose height is 16 cm. Suppose that the water is poured into the cup at a rate of $8 \text{ cm}^3/s$. How fast is the water level rising when the water is 8 cm deep?

- A. $\frac{\pi}{2} \text{ cm/s}$,
- B. $\frac{1}{2\pi} \text{ cm/s}$
- C. $2\pi + 4 \text{ cm/s}$
- D. $\frac{\pi}{3} + 2 \text{ cm/s}$
- E. $\frac{3}{4\pi+2} \text{ cm/s}$

11. A ladder 20 ft long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a speed of 3 ft/s, how fast is the angle between the wall and the ladder at the top increasing when the angle is $\pi/3$ rad ?

- A. $\frac{\pi}{3}$ rad/s
- B. $\frac{\sqrt{3}}{10}$ rad/s
- C. $\frac{3}{10}$ rad/s
- D. $\frac{\pi}{\sqrt{3}}$ rad/s
- E. $\frac{3}{\pi}$ rad/s

12. A lighthouse is located on a small island 4 km away from the nearest point P on a straight shoreline and its light makes two revolutions per minute. How fast is the beam of light moving along the shoreline when it is 3 km from P ?
- A. $\frac{75}{\pi}$ km/min
 - B. 25π km/min
 - C. 100π km/min
 - D. $25/4$ km/min
 - E. $\frac{100}{\pi}$ km/min