MA 16500
EXAM 3 INSTRUCTIONS
VERSION 01
November 12, 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. Let $f(x) = -x^3 + 3x + 6$. Let M be the absolute maximum value of $f(x)$ and m the absolute minimum value of $f(x)$ on $[-2, 3]$. What is $M - m$?

   A. 4

   B. 28

   C. 20

   D. 8

   E. 16

2. The first derivative of a function $f(x)$ is given by $f'(x) = x(x-1)^2(x-2)^3(x-3)^4(x-4)^5$. How many local minima of f are there on $(-\infty, \infty)$?

   A. 0

   B. 1

   C. 2

   D. 3

   E. We need the formula for $f(x)$ to determine the value and to see whether it is a local minimum. So we can NOT determine how many local minima there re on $(-\infty, \infty)$ from the given data.

3. Consider the function $f(x) = xe^{2x}$. Which of the following statements are true ?

(1) f is increasing on $(-\frac{1}{2}, \infty)$.
(2) f is concave down on $(-\infty, -1)$.
(3) f has one local maximum on $(-\infty, \infty)$.

A. (1), (2), and (3)

B. (3) only

C. (1) only

D. (1) and (2)

E. (2) and (3)

4. Consider the function $y = f(x) = (x-1)^5(x-3)^6$ on $(-\infty, \infty)$.

Then

(a) the local maximum, and
(b) the local minimum

of the function are attained when

A. (a) $x = 3$ (b) $x = 1$

B. (a) $x = 1$ (b) $x = 3$

C. (a) $x = 1$ (b) $x = \frac{21}{11}$

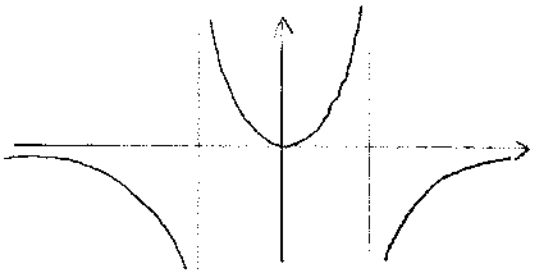
D. (a) $x = 3$ (b) $x = \frac{21}{11}$

E. (a) $x = \frac{21}{11}$ (b) $x = 3$

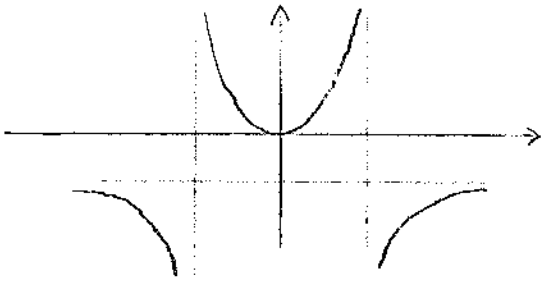
5. Choose the picture from below that best describes the graph of the function

$$f(x) = \frac{2x^2}{x^2 - 9}.$$

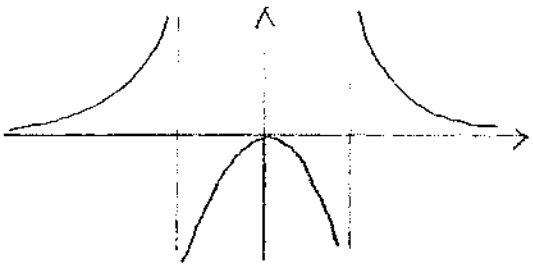
A.



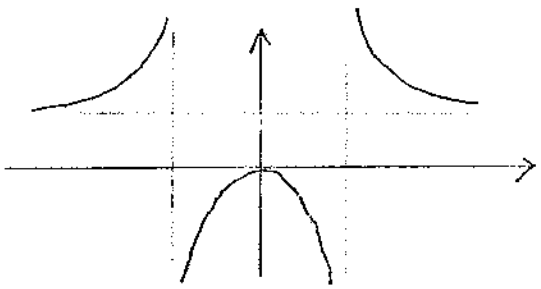
B.



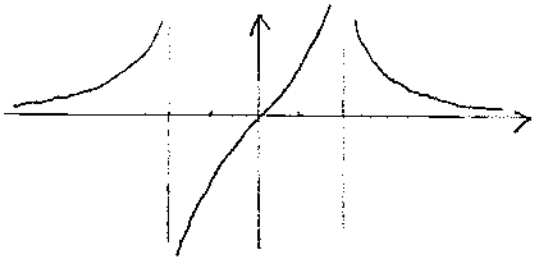
C.



D.



E.



6. Compute the following limits

(a) $\lim_{x\to 0} \frac{\ln(1+3x^2)}{\ln(1+4x^2)}$

(b) $\lim_{x\to 0} \frac{\sin x}{e^x}$

A. (a) $\frac{3}{4}$ (b) 0

B. (a) $\frac{3}{4}$ (b) 1

C. (a) ∞ (b) 0

D. (a) ∞ (b) 1

E. (a) 1 (b) 0

7. Compute $\lim_{x\to\infty}\left[\tan(\frac{\pi}{x})\cdot\ln x\right]$

A. 0

B. 1

C. π

D. $\pi/2$

E. The limit does not exist.

8. Choose the right statement from below about the two functions

$f(x) = 2\sin^{-1}(x)$ and $g(x) = 2 + \cos^{-1}(1 - 2x^2)$

on the interval $[0, 1]$.

A. We observe $f'(x) - g'(x) = 0$ and $f(x) = g(x)$ on the interval $[0, 1]$.

B. We observe $f'(x) - g'(x) = 0$ and $f(x) = g(x) - 2$ on the interval $[0, 1]$.

C. We observe $f'(x) - g'(x) = 0$ and $f(x) = g(x) + 2$ on the interval $[0, 1]$.

D. We observe $f'(x) = -g'(x)$ and $f(x) = -g(x)$ on the interval $[0, 1]$.

E. The graphs of $y = f(x)$ and $y = g(x)$ are symmetric with respect to the line $y = x$, because they are inverse functions.

9. Compute $\lim_{x\to 0} [\cos(2x)]^{1/x^2}$.

A. e^2

B. e^{-1}

C. e

D. 1

E. e^{-2}

10. A farmer with 20 ft of fencing would like to enclose a rectangular region and then divide it into 3 pens with fencing parallel to one side of the rectangle. What is the largest possible total area of the 3 pens in square ft?

A. $\frac{25}{4}$

B. $\frac{25}{2}$

C. 25

D. $\frac{25}{8}$

E. 100

11. Let Q be the point on the curve $y = \sqrt{2x+1}$ which is closest to $(4, 0)$. The x-coordinate of Q is

A. $\frac{5}{3}$

B. $\frac{\sqrt{3}}{2}$

C. 3

D. $\frac{5}{2}$

E. $\sqrt{3}$

12. A cone-shaped drinking cup is made from a circular piece of paper of radius 3 by cutting out a sector and joining the edges CA and CB. (See the picture below.)

Find the maximum capacity of such a cup.

A. 2π

B. $2\sqrt{3}\pi$

C. $\sqrt{3}\pi$

D. π

E. $\frac{\pi}{3}$