VERSION 01

Your 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. On the scantron, Write 01 in the TEST/QUIZ NUMBER boxes and blacken in the appropriate spaces below. Your scantron should be the same color as the cover page of the exam.
3. On the scantron sheet, fill in your YOUR NAME and PURDUE ID NUMBER, and blacken in the appropriate spaces below.
4. On the scantron sheet, fill in the four digit SECTION NUMBER. Enter ZERO as the first digit.
5. Sign the scantron sheet.
6. On the scantron sheet, blacken your choice of the correct answer in the spaces provided for each of the questions 1-12. Do all your work on the exam booklet. Show your work on the exam booklet. Although no partial credit will be given, any disputes about grades or grading will be settled by examining your written work on the exam booklet.
7. There are 12 questions, each worth 8 points. The maximum possible score is 8 x 12 + 4 (for taking the exam) = 100 points.
8. NO calculator, electronic devices, books or papers are allowed. Use the back of the test pages for scrap paper.
9. After you finish the exam, turn in BOTH the scantron sheets and the exam booklets.
10. If you finish the exam 5 minutes before the ending time, you may leave the room after turning in your scantron sheet and the exam booklet. If you don't finish before 5 minutes before the ending time, you should REMAIN SEATED until your TA comes and collects your scantron sheet and exam booklet. Do not talk to other students until after you have left the exam room.

Exam Policies

1. Students must sit in preassigned seating areas.
2. Students may not open the exam until instructed to do so.
3. No student may leave in the first 20 minutes or in the last 5 minutes of the exam.
4. Students late for more than 20 minutes 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 exam booklet.
6. Any violation of the above rules may result in a 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 give any kind of help to anyone to answer questions on the exam.
3. Your are not allowed to look at the exam of another student. You may not compare answers with anyone else or consult another person until after you have finished your exam, handed it in to your instructor **and** left the exam room.
4. You may not consult notes, book or 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 exam room.
5. Anyone who violates these instructions will have committed an act of academic dishonesty. Any violation of these rules and any act of academic dishonesty may result in severe penalties. Additionally, all violators will be reported to the Office of the Dean of Students.

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

Print your name ______________________________

Student signature ______________________________

1. Let m and M be the absolute minimum and maximum of $f(x) = x^3 - 6x^2$ on the interval $[-3, 5]$. Then $M - m =$

   A. 13

   B. 21

   C. 56

   D. 62

   E. 81

2. The Mean Value Theorem applied to $f(x) = x^3 - 3x + 2$ on the interval $[-2, 2]$ claims that there exists a number c, $-2 < c < 2$, such that $f'(c) =$

   A. 0

   B. 1

   C. 2

   D. 3

   E. 4

3. Let $f(x) = \dfrac{1}{x^2+1}$. Then $y = f(x)$ is concave upward for

   A. $-\infty < x < \infty$

   B. $x \leq -\dfrac{\sqrt{3}}{3}$

   C. $x \geq \dfrac{\sqrt{3}}{3}$

   D. $-\dfrac{\sqrt{3}}{3} \leq x \leq \dfrac{\sqrt{3}}{3}$

   E. $-\infty \leq x \leq -\dfrac{\sqrt{3}}{3}$ and $\dfrac{\sqrt{3}}{3} \leq x \leq \infty$

4. Let $f(x) = \dfrac{x}{x^2+1}$. Then $f(x)$ is increasing on

   A. $(-\infty, -1]$ and $[1, \infty)$

   B. $[-1, 1]$

   C. $[-1, 0]$ and $[1, \infty)$

   D. $(-\infty, -1]$ and $[0, 1]$

   E. $(-\infty, \infty)$

5. Let $f(x) = \tan x - \sin x$. Then the critical point $x = 0$ of $f(x)$ is

   A. a local minimum but not an inflection point.

   B. a local maximum but not an inflection point.

   C. an inflection point but neither a local minimum nor a local maximum.

   D. an inflection point and a local minimum.

   E. an inflection point and a local maximum.

6. $\lim_{x \to 0} \dfrac{e^x - e^{-x} - 2x}{x - \sin x} =$

   A. 2

   B. 1

   C. 0

   D. -1

   E. -2

7. $\lim_{x\to 4}\left(\frac{1}{\sqrt{x}-2}-\frac{4}{x-4}\right)=$

A. 0

B. $\frac{1}{8}$

C. $\frac{1}{4}$

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

E. 1

8. $\lim_{x\to\infty}\left(1+\frac{4}{3x}\right)^{2x}=$

A. 1

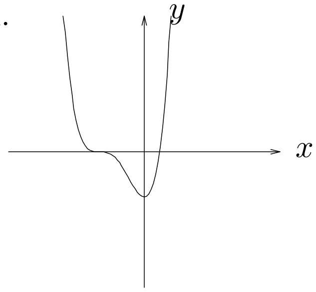
B. $e^{1/2}$

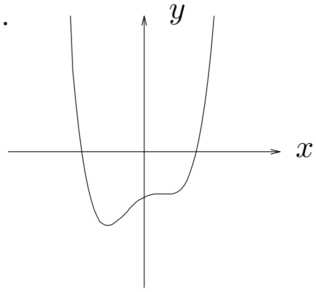
C. $e^{2/3}$

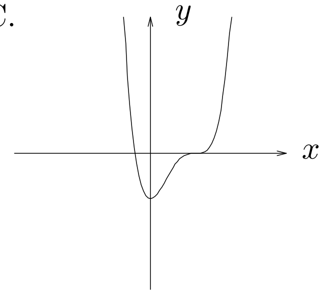
D. $e^{8/3}$

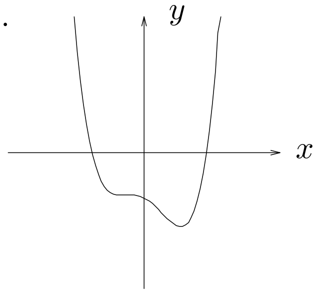
E. $e^{3/2}$

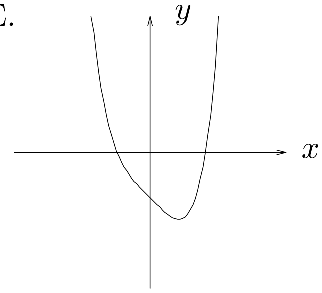
9. Which graph looks most like the graph of $f(x) = 3x^4 - 8x^3 + 6x^2 - 1$?

A.


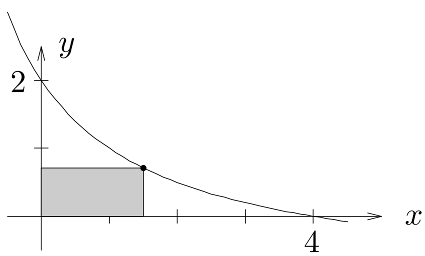
B.


C.


D.


E.


10. Find the x-coordinate of the upper right corner of the rectangle of maximum area inscribed in the region in the first quadrant bounded by the graph of $y = \dfrac{4-x}{2+x}$ and the x- and y-axes.



A. $x = 2\sqrt{3} - 2$

B. $x = 4\sqrt{3} - 4$

C. $x = 4\sqrt{3} - 2$

D. $x = 4 - 2\sqrt{3}$

E. $x = \sqrt{3} - 1$

11. A line through the point $(4,3)$ forms a right triangle in the first quadrant with the positive x- and y- axes. If m is the slope of the line, find a function A of m that gives the area of the triangle.

A. $A(m) = -\dfrac{(3-4m)^2}{m}$

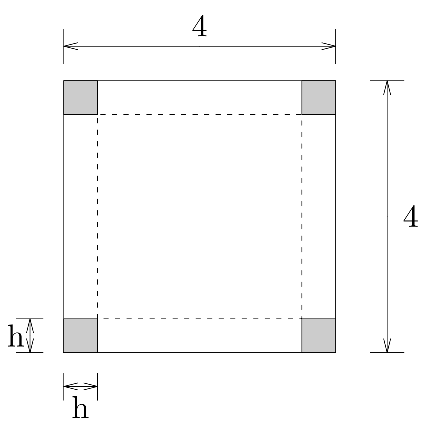
B. $A(m) = -\dfrac{(3-4m)^2}{2m}$

C. $A(m) = -\dfrac{(4-3m)^2}{m}$

D. $A(m) = -\dfrac{(4-3m)^2}{2m}$

E. $A(m) = -\dfrac{(2-4m)^2}{2m}$

12. An open box (a box that has no top) is made from a 4 inch by 4 inch square of cardboard by cutting out squares of side length h from each corner and then folding up the sides along the dotted lines. Find the *total* area of the 4 squares that are removed from the 4 corners so that the box has maximum volume.



A. $\dfrac{1}{4}$ in^2

B. $\dfrac{25}{4}$ in^2

C. 4 in^2

D. $\dfrac{16}{9}$ in^2

E. $\dfrac{10}{9}$ in^2