MA 16100
EXAM 3 Form 01
April 4, 2019

NAME ———————————— YOUR TA'S NAME ————————————

STUDENT ID # ———————————— RECITATION TIME ————————————

Be sure the paper you are looking at right now is GREEN! Write the following in the TEST/QUIZ NUMBER boxes (and blacken in the appropriate spaces below the boxes): 01

You must use a #2 pencil on the mark–sense sheet (answer sheet). On the mark–sense sheet, fill in your TA's name and the COURSE number. Fill in your NAME and STUDENT IDENTIFICATION NUMBER and blacken in the appropriate spaces. Fill in your four-digit SECTION NUMBER. If you do not know your section number, ask your TA. Sign the mark–sense sheet.

There are **12** questions, each worth 8 points (you will automatically earn 4 point for taking the exam). Blacken in your choice of the correct answer in the spaces provided for questions 1–12. Do all your work in this exam booklet. Use the back of the test pages for scrap paper. Turn in both the scantron and the exam booklet when you are finished.

If you finish the exam before 8:50, you may leave the room after turning in the scantron sheet and the exam booklet. You may not leave the room before 8:20. If you don't finish before 8:50, you MUST REMAIN SEATED until your TA comes and collects your scantron sheet and your exam booklet.

EXAM POLICIES

1. Students may not open the exam until instructed to do so.

2. Students must obey the orders and requests by all proctors, TAs, and lecturers.

3. No student may leave in the first 20 min or in the last 10 min of the exam.

4. Books, notes, calculators, or any electronic devices are not allowed on the exam, and they should not even be in sight in the exam room. Students may not look at anybody else's test, and may not communicate with anybody else except, if they have a question, with their TA or lecturer.

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 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 rules stated above:

STUDENT NAME: ————————————————————————————

STUDENT SIGNATURE: ————————————————————————————

1

1. The graph of the **velocity** function of a particle is shown below. On what interval(s) is the particle **speeding up**?
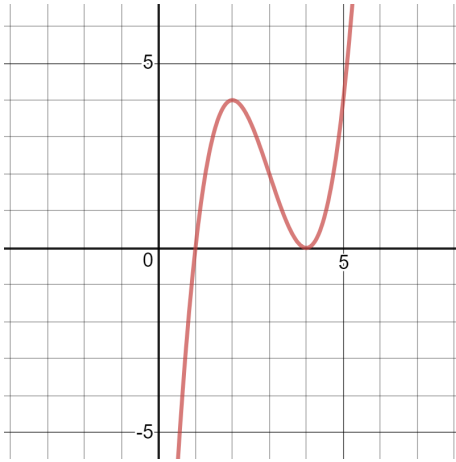
A. $(0, 1)$ only

B. $(1, 2)$ only

C. $(0, 1)$ and $(2, 4)$

D. $(1, 2)$ and $(4, \infty)$

E. $(0, 1)$ and $(1, 2)$

2. If $f(x) = \cosh(\sinh(x))$, find $f'(x)$

A. $-\sinh(\cosh(x))$

B. $\sinh(\cosh(x))$

C. $-\sinh(x)\cosh(x)$

D. $-\sinh(\sinh(x))\cosh(x)$

E. $\sinh(\sinh(x))\cosh(x)$

3. A certain bacteria culture grows at a rate proportional to its size. If the size of the culture doubles every 7 days, how long, in days, does it take for the initial size to triple?

A. $\dfrac{\ln 14}{\ln 2}$

B. $\dfrac{3\ln 7}{\ln 2}$

C. $\dfrac{7\ln 3}{\ln 2}$

D. $\dfrac{3\ln 2}{\ln 7}$

E. $\dfrac{7\ln 2}{\ln 3}$

4. The length of a rectangle is increasing at a constant rate of 8 cm/s and its width is decreasing at a constant rate of 3 cm/s. How fast, in cm^2/s, is the area of the rectangle increasing at the moment when the length is 20 cm and the width is 10 cm?

A. 140

B. 130

C. 40

D. 24

E. 20

5. An airplane flying horizontally at a constant altitude of 3 miles and a constant speed of 800 miles per hour passes over a control tower. Find the rate of change, in miles per hour, of the distance between the plane and the tower when the plane is 5 miles away from the tower.

A. 640

B. 1020

C. 760

D. 780

E. 920

6. Use a linear approximation to estimate the value of $e^{-0.01}$

A. 1.001

B. 1.01

C. 0.9

D. 0.99

E. 0.999

7. Find the absolute maximum and minimum **values** of the function $f(x) = \cos x + \sin x$ on the interval $[0, \pi]$.

A. max: $\sqrt{2}$; min: -1

B. max: $\frac{\pi}{4}$; min: π

C. max: 2; min: -2

D. max: 1; min: -1

E. max: π; min: 0

8. Which of the following statements are true?

I. $\sqrt{x}$ has an absolute maximum

II. $f(x) = x^3$, $-3 \leq x \leq 1$ satisfies the requirements of the Mean Value Theorem.

III. Rolle's Theorem guarantees at least one value of c, $0 < c < 1$ where the graph of $f(x) = \tan(\pi x)$ has a horizontal tangent line.

A. I only

B. II only

C. III only

D. II and III

E. None of them is true

9. A certain function $f(x)$ has the following first and second derivatives: $f'(x) = 3x^5 - 6x^3$, $f''(x) = 15x^4 - 18x^2$. How many relative maxima does $f(x)$ have?

A. 0

B. 1

C. 2

D. 3

E. 4

10. A certain function $f(x)$ has the following first and second derivatives: $f'(x) = 3x^5 - 6x^3$, $f''(x) = 15x^4 - 18x^2$. How many inflection points does $f(x)$ have?
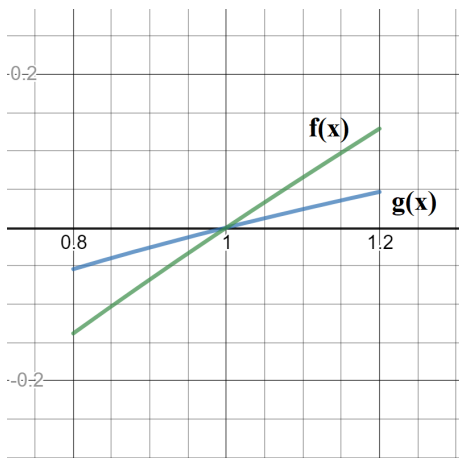
A. 0

B. 1

C. 2

D. 3

E. 4

11.

$$\lim_{x \to \pi} \frac{\cos x + \sin 2x + 1}{x^2 - \pi^2} =$$

A. $\dfrac{1}{2\pi}$

B. $\dfrac{1}{\pi}$

C. 1

D. $-\dfrac{1}{\pi}$

E. $-\dfrac{1}{2\pi}$

12. Based on the graph below, what can we say about $\lim\limits_{x \to 1} \dfrac{f(x)}{g(x)}$?

A. $\lim\limits_{x \to 1} \dfrac{f(x)}{g(x)} > 1$

B. $0 < \lim\limits_{x \to 1} \dfrac{f(x)}{g(x)} < 1$

C. $\lim\limits_{x \to 1} \dfrac{f(x)}{g(x)} = 0$

D. $\lim\limits_{x \to 1} \dfrac{f(x)}{g(x)} = 1$

E. $\lim\limits_{x \to 1} \dfrac{f(x)}{g(x)}$ does not exist