MAT133Y Term Test 3

Thursday July 19, 2018, 7:10 pm − 9:00 pm
Duration - 110 minutes

Surname: _____

Given Name: _____

Student Number: _____

Tutorial Section: _____

Allowed Aid: A TI-30X IIS calculator, to be supplied by the student. **No other aid is allowed.**

Instruction:

- Fill in all required information on this cover sheet and **the multiple choice answer sheet on the last page of your exam. DO NO TEAR THE ANSWER SHEET. MARK WILL ONLY BE AWARDED TO ANSWERS ON THE ANSWER SHEET!**

- This exam contains 14 pages (including this cover page) and 5 problems. Once the exam begins, check to see if any pages are missing.

- Unless otherwise indicated, you are required to show your work on each problem on this exam. If you need more space, use the back of the pages; clearly indicate when you have done this.

- On the written portion of the test, **BLANK ANSWER WILL RECEIVE 2 MARKS PER QUESTION or 1 MARK PER SUBQUESTION.** Leave a question or a subquestion blank if you do not know how to do it. You will not be entitled to the free mark if you attempted the question.

- Questions are not order in increasing order of difficulties. Be sure to read through all the problems and plan your time well.

Section	Time	Location	Instructor
TUT0101	T 14 − 15	BA 2139	Tristan Milne
TUT0101	R 14 − 15	BA 2139	
TUT0102	T 14 − 15	BA 1230	Kai Wang
TUT0102	R 14 − 15	BA 1230	
TUT0103	T 14 − 15	BA 2195	Dmitri Chouchkov
TUT0103	R 14 − 15	BA 2195	
TUT0201	T 15 − 16	BA 2139	Tristan Milne
TUT0201	R 15 − 16	BA 2139	
TUT0202	T 15 − 16	BA 1230	Kai Wang
TUT0202	R 15 − 16	BA 1230	

Problem	Points	Score
1	40	
2	15	
3	15	
4	15	
5	15	
Total:	100	

Part 1: Multiply Choice (40 marks)

Multiple Choice Questions

1. Multiple choice.

    1 (4 points) Find $\int \frac{1}{x} dx$

    A. $0 + C$
    B. $\ln |x| + C$
    C. $x + C$
    D. $-x^{-2} + C$
    E. $1 + C$

    2 (4 points) Critical point(s) of $f(x) = x(x^2 - 3)$ is/are

    A. $0, \pm\sqrt{3}$
    B. ± 1
    C. $0, \pm 1$
    D. ± 3
    E. 0

3 (4 points) Find

$$\int \frac{x}{\sqrt{x^2 + 2}}$$

explicitly.

A. $\sqrt{x^2 + 2} + C$

B. $x\sqrt{x^2 + 2} + C$

C. $\frac{x}{\sqrt{x^2+2}} + C$

D. $2(x^2 + 2)^{-3/2} + C$

E. $(x^2 + 2)^{-1/2} + C$

4 (4 points) If $2x^2 + y^2 = 4$, then $\frac{dy}{dx}$ at $(0, 2)$ is

A. 0

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

C. 1

D. 4

E. 8

5 (4 points) If $f(x) = x^x$, then $f'(x) =$

A. $(\ln x)x^x$

B. $x \cdot x^{x-1}$

C. x^x

D. $x^x(\ln(x) + 1)$

E. $e^{x \ln x}$

6 (4 points) Let

$$y = \frac{2x^3 + 6}{x^2}$$

What is the equation of the asymptote of y?

A. $y = 2$

B. $y = 2x$

C. $y = 2x + 6$

D. $y = 6$

E. $y = 6x + 2$

7 (4 points) What types of asymptote(s) does the following function have

$$f(x) = \frac{x^2 - 1}{(x-1)(2x-3)}$$

 A. Horizontal asymptote $y = \frac{1}{2}$ and vertical asymptote $x = \frac{3}{2}$
 B. Horizontal asymptote $y = 1$
 C. Vertical asymptote $x = 1$
 D. Horizontal asymptote $y = \frac{3}{2}$
 E. No asymptote

8 (4 points) Let $y = 3x^4 - 4x^3$. On the interval $[0,2]$, the minimum value of y is obtained at $x =$?
 A. 0
 B. 1/4
 C. 1/2
 D. 1
 E. 2

9 (4 points) Suppose that $f(x)$ is differentiable and $f'(1) = 0$. Which of the following statement is necessarily true?

A. $f(x)$ has relative max. at $x = 1$
B. $f(x)$ has relative min. at $x = 1$
C. $f(x)$ has no relative max. nor relative min. at $x = 1$
D. $f(x)$ has critical point $(1, f(1))$
E. $f(x)$ has a point of inflection at $x = 1$

10 (4 points) Find

$$\int 1 + 3x^2\,dx$$

explicitly.

A. $6x + C$
B. $1 + 6x + C$
C. $x + 6x^3 + C$
D. $x + 3x^3 + C$
E. $x + x^3 + C$

Part 2: Long Answers (60 marks)

Show your work for full marks

2. (15 points) The equation $e^{3x} + e^{2y} = 10x - 4y + 2$ defines y implicitly in terms of x near the point $(0,0)$. Find an expression for y' in terms of x and y and evaluate this expression at $(0,0)$.

3. (15 points) Use Newton's method to approximate the solution to $f(x) = x^4 - x - 3 = 0$ between $x = 1$ and $x = 2$. Start at the point $x_0 = 1.5$ and perform **two** iterations. Be sure to leave at least 4 decimal places in your final answers.

4. Sketch the following curve

$$f(x) = x^3 - 3x^2 + 2.$$

by following the steps below.

(a) (3 points) Given that $f(1) = 0$, find x/y intercepts.

(b) (5 points) intervals on which f increases/decreases and find relative max. and relative min.

(c) (5 points) intervals of concavity and point(s) of inflection.

(d) (2 points) Use the previous 3 parts to draw the curve. Be sure to label the x/y-intercepts, critical point(s), and point(s) of inflection.

5. Compute the following integrals

   (a) (7 points)

$$\int \frac{x}{x+1} dx$$

   (Hint: $x = x + 1 - 1$.)

(b) (8 points) Suppose that
$$y = \int 4x^3 + 2e^{x-1}\,dx$$

and $y(1) = 2$. Compute y explicitly in terms of x.

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University of Toronto

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Multiple Choice Answer Sheet

Question Number	Answer
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	