

MAT 1320 C Fall 2008
Supplemental / Deferred Exam
February 2009

Instructor: Melanie McKay

Duration: 3 hours

Name (print): _____

Student Number: _____

Instructions:

- **Basic scientific calculators (single-line display, non-programmable, no differentiation or integration capabilities) are permitted. No Notes or Books.**
- Print your name and student number on this page.
- Verify that your copy of the exam has all 14 pages.
- You must answer all questions.
- There are 8 multiple choice questions worth 2 marks each, 8 short answer questions worth 2 marks each and 4 longer answer questions worth 18 marks for a total of 50.
- For the multiple choice questions, write your answer clearly in the box provided after the question. Ambiguous answers will not be marked.
- For the short and long answer questions, write your answers in the space provided (use the backs of the pages if necessary) and show all of your work.
- There are two pages provided for rough work (pages 13 and 14).
- Only this questionnaire will be marked.
- Do not unstaple the pages (except for pages 13 and 14, which may be detached).

Section A: Multiple Choice Questions (2 marks each)**Question 1**Evaluate $\int_0^{\pi/2} \cos^3 \theta \sin \theta \, d\theta$.

- (A) 1/2 (B) 1/4 (C)
- $1/\sqrt{2}$
- (D) 1/16 (E) 1/8 (F) 1/32

Answer for question 1:

Question 2Consider the function $f(x) = x^3 - 3x^2 + 7x - 4$. Which of the following statements is **true** ?

- (A) (1, 1) is a local maximum
-
- (B) (1, 1) is a local minimum
-
- (C) (1, 1) is a critical point that is not a local extremum
-
- (D) (1, 1) is an inflection point
-
- (E) (1, 1) is not a special point

Answer for question 2:

Question 3What is $f'(1)$ if $f(x) = \arctan(2x)$?

- (A) 2/3 (B) 2 (C) 2/5 (D) 1/2 (E) 1/3 (F) 1/5

Answer for question 3:

Question 4What is $\int_0^3 2^x \, dx$?

- (A) 8 (B) 7 (C) 4.85 (D) 9.89 (E) 10.1 (F) 8.79

Answer for question 4:

Question 5

On what interval(s) is the function $f(x) = (x^2 - 4x + 5)e^x$ concave up ?

- (A) it never is (B) $x > 1$ (C) $x < -1$ and $x > 1$
(D) it always is (E) $-1 < x < 1$ (F) $x < -1$

Answer for question 5:

Question 6

Where are the critical points of the function $f(x) = x^3 + 3x + 17$?

- (A) it has none (B) $x = \pm 1$ (C) $x = 0$
(D) $x = 0$ and $x = \pm 1$ (E) $x = 1$ (F) $x = 0$ and $x = 1$

Answer for question 6:

Question 7

What is the slope of the tangent line to the curve $xe^x + x^2y^2 + y = 2$ at the point $(0, 2)$?

- (A) undefined (B) 1 (C) 1/2 (D) -1/2 (E) -1 (F) 0

Answer for question 7:

Question 8

At what value(s) of x does the graph of $y = (x^2 + 1)^3$ have a horizontal tangent ?

- (A) 1, -1 (B) never (C) 0, 1, -1 (D) 0 (E) 2, -2 (F) 0, 2, -2

Answer for question 8:

Section B: Short Answer Questions (2 marks each)**Question 9**

If $g(x) = \int_1^x \ln(2t^2 + 3) dt$, what is $g''(x)$?

Question 10

If $f(x)$ is a continuous function such that

$$\int_0^{10} f(x) dx = 12 \quad \text{and} \quad \int_6^{10} f(x) dx = 15,$$

what is $\int_0^6 3f(x) dx$?

Question 11

Newton's Method is being used to find a root of $f(x) = x^3 + 5x - 7$ with $x_1 = 1$. What is the value of x_2 ?

Question 12

Using the velocity data in the table below, make both an overestimate and underestimate of the distance the car travels in the 5 s.

t (s)	0	1	2	3	4	5
v (m/s)	4	10	16	24	33	40

Question 13

Find the tangent line approximation to $f(x) = \sqrt{2x+4}$ near $x = 0$ and use it to make a rough approximation of $\sqrt{6}$.

Question 14

The top of a ladder 4 m long is sliding down a wall at 1 m/s. How fast is the bottom of the ladder sliding away from the wall when it is 2 m from the wall ?

Question 15

Evaluate $\lim_{x \rightarrow 0^+} (\csc x - \cot x)$.

Question 16

What is the largest rectangular area that can be enclosed with 200 m of fence ?

Section C: Long Answer Questions

Question 17 (4 marks)

Find (and simplify where possible) the derivatives of the following functions:

(a) $f(t) = \left(\frac{2t^2 + t}{3t + 5} \right)^4$

(b) $y = \cos(x^2 \ln x + e^{-2x})$

Question 18 (2 marks)

Sketch a graph of a continuous function satisfying the following properties:

- i) $f(x) = 0$ if $x = -2$ and 2
- ii) $f'(x) < 0$ if $-2 < x < 0$
- iii) $f'(x) > 0$ if $x < -2$ and $x > 0$
- iv) $f''(x) < 0$ if $x < -1$
- v) $f''(x) > 0$ if $x > -1$
- vi) $f(0) = -4$

Label the special features on the graph. If $f(x)$ were a polynomial, what degree would it be ?

Question 19 (8 marks)

Find the following:

(a) $\int \arcsin x \, dx$

(b) $\int e^x \cos x \, dx$

(c) $\int \frac{2e^x}{e^x + 5} dx$

(d) $\int 2x(3x^2 + 1)^{3/4} dx$

Question 20 (4 marks)

Approximate the integral $\int_0^4 \frac{1}{x+1} dx$ numerically to 4 decimal places with $n = 4$ subdivisions with the Midpoint Rule and Simpson's Rule (*ie* calculate M_4 and S_4). What is the true value? Which method gives the better result?

(Extra page for rough work)

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