

- 5 marks 1. Suppose that $f(1) = 2$, $f(4) = 7$, $f'(1) = 5$, $f'(4) = 3$, and f'' is continuous. Find the value of

$$\int_1^4 x f''(x) dx$$

10 marks 2. Evaluate the integrals:

(a) $\int_6^{13} \frac{dx}{2\sqrt{x+3} + x}$

(b) $\int_0^1 \frac{\ln x}{\sqrt{x}} dx$

7 marks 3.

$$(a) \sum_{n=1}^{\infty} (e^{1/n} - e^{1/(n+1)}) =$$

$$(b) \frac{1}{1 \cdot 3} - \frac{1}{3 \cdot 3^3} + \frac{1}{5 \cdot 3^5} - \frac{1}{7 \cdot 3^7} + \frac{1}{9 \cdot 3^9} - \dots =$$

- 10 marks* 4. Find the Maclaurin series for $f(x) = e^{2x} + \cos(3x)$ and for $g(x) = \ln(1 + 2x^2)$. Determine the radius of convergence for each.

- 5 marks 5. Find the Taylor series centered at $a = 5$ for $f(x) = \ln(2x + 3)$.

8 marks 6. (a) If $f(x) = \sum_{i=0}^{\infty} c_i(x-a)^i$ for $|x-a| < R$, show that

$$c_i = \frac{f^{(i)}(a)}{i!}$$

for $i = 0, 1, 2, \dots$

(where $f^{(0)}(a) = f(a)$, and for $i \geq 1$ $f^{(i)}(a)$ denotes the i -th derivative of f at a).

(b) If $f(x) = 5x^{514}e^{x^2}$, find $f^{(2014)}(0)$.

6 marks 7. Solve the initial value problem:

$$\frac{dy}{dx} = \frac{xy \sin x}{y + 1}$$
$$y(0) = 1$$

- 12 marks 8. (*Note: to receive any credit in this problem you must state very clearly which arc length formula you are attempting to use.*)

Find the length of each of the following curves:

(a) $y = \frac{x^3}{3} + \frac{1}{4x}$, $1 \leq x \leq 2$

(b) $x = 3 \cos t - \cos(3t)$, $y = 3 \sin t - \sin(3t)$, $0 \leq t \leq \pi$

(c) $r = 5^\Theta$, $0 \leq \Theta \leq 2\pi$

- 7
marks
9. Sketch the curve and find the area that it encloses

$$r = 4 + 3 \sin \Theta$$

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Instructor's Name (**Print**)

Student's Name (**Print**)

Student's Signature

THE UNIVERSITY OF WESTERN ONTARIO
LONDON CANADA
DEPARTMENTS OF APPLIED MATHEMATICS AND MATHEMATICS

Calculus 1501B Final Examination

Tuesday, April 29, 2014

7:00 p.m. - 10:00 p.m.

INSTRUCTIONS

1. **SHOW ALL OF YOUR WORK AND PROVIDE CLEAR EXPLANATION. All results must be justified unless you are instructed otherwise. Unjustified answers will receive little or no credit.**
2. DO NOT UNSTAPLE THE BOOKLET.
3. Questions start on Page 1 and continue to Page 10. Questions are printed on both sides of the paper. Should you require extra space for any answer, Page 11 is provided for this purpose. BE SURE YOUR BOOKLET IS COMPLETE.
4. CALCULATORS, ELECTRONIC DEVICES, BOOKS, NOTES, OTHER AIDS ARE **NOT** PERMITTED.
5. Total Marks = 70.
6. Fill in the top of this page. CIRCLE YOUR SECTION BELOW.

001 F. Fathizadeh

002 T. Barron

Student Number (**Print**)

Student's Name (**Print**)

FOR GRADING ONLY

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