PART A - Multiple Choice (20 marks)

Circle your answer in each question below **and** mark it on the (scantron) answer sheet. Code as you go. Extra time will NOT be given for coding answers at the end of the exam. Be advised that ONLY THE SCANTRON CARD WILL BE MARKED IN THIS SECTION, but only this question paper will be returned to you.

1 mark A1. Find $f''(1)$ where $f(x) = \dfrac{1}{x^2}$.

A: 1	B: 6	C: -2	D: -6	E: -3

1 mark A2. Find $f''(4)$ where $f(x) = \sqrt{x}$.

A: $-\dfrac{1}{4}$	B: $\dfrac{1}{16}$	C: $-\dfrac{1}{32}$	D: $\dfrac{1}{64}$	E: $-\dfrac{1}{8}$

1 mark A3. Find $f'''(0)$ where $f(x) = (1+x)^4$.

A: 4	B: 12	C: 0	D: 24	E: 6

1 mark A4. Find $f''(x)$ where $f(x) = (x^2+2)^2$

A: $12x^2+8$	B: $4x^3+8x$	C: $4x$	D: $24x$	E: $4x^2+8$

Use the information given here to answer questions A5 and A6.
The position of an object, in metres at any time $t \geq 0$, is given by $s(t) = t^2 - 8t + 20$.

1 mark A5. What is the velocity of the object at time $t = 1$?

A: -6	B: 6	C: 2	D: -8	E: 0

1 mark A6. What is the initial acceleration of the object?

A: 20	B: -8	C: 2	D: 1	E: 0

1 mark A7. Find $\dfrac{dy}{dx}$ where $\ln(xy) = e$.

A: $\dfrac{x}{y}$	B: $-\dfrac{x}{y}$	C: $\dfrac{y}{x}$	D: $-\dfrac{y}{x}$	E: $\dfrac{1}{xy}$

1 mark A8. Find the slope of the tangent line to the curve $x^2 + y^2 = 16$ at the point $(2, 2\sqrt{3})$.

A: $-\dfrac{4}{3}$	B: $\dfrac{1}{\sqrt{3}}$	C: $-\dfrac{1}{\sqrt{3}}$	D: $\dfrac{1}{3}$	E: $\sqrt{3}$

1 mark A9. Simplify $\log_{10} 100 - \log_{10} 1000 + \log_{10} 10$.

A: 1	B: 6	C: 0	D: -1	E: 2

1 mark A10. Simplify $\dfrac{\sqrt[3]{8a^5}}{\sqrt[3]{a^2}}$.

A: a^3	B: $a^{3/2}$	C: $2a^{3/2}$	D: $2a$	E: $\dfrac{1}{2a}$

1 mark A11. Simplify $\left(z^2\right)^2 \left(z^{-4b/a}\right)^{a/b}$.

A: z^8	B: z^{-4}	C: 1	D: z^4	E: 0

1 mark A12. Solve for x in the equation $3^{3x-7} = 3^5$.

A: $x = 3$	B: $x = 4$	C: $x = -\dfrac{2}{3}$	D: $x = \dfrac{7}{3}$	E: $x = \dfrac{5}{3}$

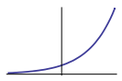
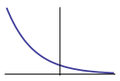
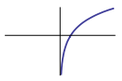
1 mark A13. Simplify $\log_3 \left(\dfrac{3^{(x^2)}}{\sqrt{3}}\right)$.

A: $\dfrac{x^2}{2}$	B: $\log_3 \left(\dfrac{x^2}{2}\right)$	C: $x^2 - \dfrac{1}{2}$	D: $x^2 + \dfrac{1}{2}$	E: $2\log_3 x$

1 mark A14. If $f(x) = xe^{-x}$, find the value of x at which the graph of $y = f(x)$ has a horizontal tangent line.

A: $x = 0$	B: $x = -1$	C: $x = 1$	D: $x = -e$	E: no value of x

1 mark A15. Which one of the following has the same basic shape as the graph of $y = \ln x$?

A: 	B: 	C: 	D: 	E: None of A,B,C or D

1 mark A16. If $f(x) = \log_2\left(2x^3\right)$, find $f'(x)$.

A: $\dfrac{3}{(2\ln 2)x}$	B: $\dfrac{3}{x\ln 2}$	C: $\dfrac{1}{2x^3}$	D: $\dfrac{3}{x}$	E: none of A, B, C or D

1 mark A17. Which one of the following expressions is equal to $\log_7 21$?

A: $\log_3 21$	B: $3\log_3 7$	C: $\log_5 21$	D: $\dfrac{\log_3 21}{\log_3 7}$	E: $\log_9 21$

1 mark A18. Solve the equation $e^{x+3} = 27$ for x.

A: $\dfrac{e^3}{3}$	B: e^{27}	C: $3\ln 3$	D: $(3\ln 3) - 3$	E: none of A, B, C or D

1 mark A19. Use logarithmic differentiation to find the value of y' when $x = 1$ if $y = x^x$.

A: 0	B: 1	C: -1	D: $1 + \ln 2$	E: y' is not defined at $x = 1$

1 mark A20. If $f(x) = \ln(x^2 + e^x)$, what is $f'(x)$?

A: $\dfrac{1}{x^2 + e^x}$	B: $\dfrac{e^x}{x^2 + e^x}$	C: $\dfrac{2x}{x^2 + e^x}$	D: $\dfrac{2x + e^x}{x^2 + e^x}$	E: $\dfrac{2}{x} + 1$

PART B (30 marks)

NOTE: SHOW ALL YOUR WORK FOR ALL QUESTIONS.

12 marks B1. Find $f'(x)$ for each of the following functions.
DO NOT SIMPLIFY YOUR ANSWERS.

(a) $f(x) = (3x^2 + e^x)(x^3 - x^2 + \ln x - 1)$

(b) $f(x) = \dfrac{2e^x}{e^x + e^{-x}}$

(c) $f(x) = 3^{1+x^2}$

(d) $f(x) = \left(3 + e^{3x^2}\right)^3$

6 marks B2. (a) Find the derivative of $f(x) = \log_2 (1 + 3^x)$.

(b) Find the second derivative of the function $f(x) = \log_5\ x^3$.

6 marks B3. (a) Use implicit differentiation to find $\dfrac{dy}{dx}$ where $x^2y = 1 + e^y$.

(b) Find $\dfrac{d^2y}{dx^2}$ if $x^3y^2 = 5$. You may leave your answer expressed in terms of x, y and $\dfrac{dy}{dx}$.
Hint: You may find it useful to express $\dfrac{dy}{dx}$ as simply as possible.

3 marks B4. Find an equation of the tangent line to the graph of $y = x \ln x$ at the point $(1, 0)$.

3 marks B5. The volume of a cube with edge length x cm is $V = x^3$.

(a) If the edge length of a particular cube is changing over time, find an expression for $\dfrac{dV}{dt}$, the change in the volume of the cube at time t.

(b) If the edge length in this cube is *shrinking* at rate $\dfrac{1}{t}$ cm per second at time t seconds, and the edge length is 2 cm at time $t = 3$ seconds, at what rate is the volume of the cube changing at that instant?

Instructor's Name (**Print**)

Student's Name (**Print**)

Student's Signature

THE UNIVERSITY OF WESTERN ONTARIO
LONDON CANADA
DEPARTMENT OF MATHEMATICS

Mathematics 0110A Test 2

Friday, November 11, 2011 **Code 111** 7:00 p.m. - 8:30 p.m.

INSTRUCTIONS

1. Clearly fill in the top of this page **and the next page**.

2. There are **two parts** to this exam:
   PART A (20 marks) in multiple choice format and
   PART B (30 marks) in show your work format.

3. Do not unstaple the booklet. Questions are printed on both sides of the paper, beginning on Page 1 and continuing to Page 7. There are 20 questions in Part A and 5 questions in Part B.

4. Use the (scantron) answer sheet for Part A. Fill in the top of the answer sheet completely. You must both *print* and *code* your student number, section number (see below) and exam code (above, e.g. 222) on the answer sheet. Mark your answers to all questions (A1-A20) in the left columns of the (scantron) answer sheet **and** circle the answer on the exam (question) paper.

5. In Part B, answer all questions in the space provided, and show all your work unless otherwise instructed.

6. Exam paper, (scantron) answer sheet and all scrap paper must be handed in at the end of the exam! Only the exam paper will be returned to you.

7. CALCULATORS ARE NOT PERMITTED.

8. TOTAL MARKS = 50.

Section	*Instructor*	*Time/College*
001	A. Moatadelro	7:00 TuTh
002	F. Tiglay	9:30 MWThF
550	A. Pourkia	Huron
570	R. Valluri	King's

Student Number (**Print**)

Student's Name (**Print**)

FOR GRADING ONLY

PAGE	MARK
1–3	
4	
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