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Student's Signature Student Number

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Student's Name (Print) Instructor

THE UNVERSITY OF WESTERN ONTARIO
LONDON CANADA
DEPARTMENT OF MATHEMATICS

**Mathematics 012a Test 2**
**Code 111**

Friday, November 10, 2006 7:00 p.m. - 8:30 p.m.

INSTRUCTIONS

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

2. Do not unstaple the booklet. Questions are printed on both sides of the paper, beginning on page 2 and continuing to page 6. There are 20 questions in Part A and 6 questions in Part B.

3. Fill in the information at the top of this page as indicated.

4. Use the (scantron) answer sheet for Part A of this exam. Sign the answer sheet, and mark your STUDENT NUMBER (all 9 digits), SECTION and EXAM CODE (111 or 222) as indicated. Mark your answers to all Part A questions (1 - 20) on the (scantron) answer sheet and circle the answer on the exam (question) paper.

5. Test paper, (scantron) answer sheet and all scrap paper must be handed in at the end of the test!

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

7. CALCULATORS ARE NOT PERMITTED.

8. There are two blank pages at the end of the booklet for rough work. These may be removed, but do not remove any other pages from the booklet. The test booklet has 6 pages. CHECK THAT YOU HAVE A COMPLETE BOOKLET.

9. TOTAL MARKS = 40.

FOR GRADING ONLY

| | MARK |
|---|---|
| PART A | |
| PART B page | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| TOTAL | |

## PART A
## (18 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 test. Be advised that only the (scantron) answer sheet will be graded in this section.

A1. Let $g(x)=x^3$ and $h(x)=\frac{1}{x+1}$. Find $h(g(2))$.

| | | | | |
|---|---|---|---|---|
| A: 1/10 | B: 1/9 | C: 1/8 | D: 1/6 | E: 1/5 |

A2. If $f(x)=\frac{1}{x^2}$, find $f''(-1)$.

| | | | | |
|---|---|---|---|---|
| A: $-1/2$ | B: 2 | C: 3 | D: 6 | E: 12 |

A3. If $x^2-y^2=9$, find $\frac{dy}{dx}$.

| | | | | |
|---|---|---|---|---|
| A: $-\frac{x}{y}$ | B: $\frac{x}{y}$ | C: $-\frac{y}{x}$ | D: $\frac{y}{x}$ | E: $\frac{2x-9}{2y}$ |

A4. Let $y=u^3+u^2$ and $u=x^2+3x+1$. Find $\frac{dy}{dx}$ at $x = 0$.

| | | | | |
|---|---|---|---|---|
| A: 15 | B: 12 | C: 9 | D: 6 | E: 3 |

A5. Find the slope of the tangent line to $y^2-y=x$ at the point $(2,-1)$.

| | | | | |
|---|---|---|---|---|
| A: $-1/3$ | B: 1/2 | C: $-1/4$ | D: 1 | E: 1/3 |

Answer questions A6. – A8. using the information given below.

An object moves away from its starting point along a line. After a time, it reverses direction and moves back along the same line to its starting point. The object's distance, s (in metres), from the starting point after t seconds is given by $s=300t-t^3$.

A6. The instantaneous velocity of the object after 5 seconds is

| | | | | |
|---|---|---|---|---|
| A: 50 | B: $-75$ | C: 275 | D: $-30$ | E: 225 |

A7. The instantaneous acceleration of the object after 5 seconds is

| | | | | |
|---|---|---|---|---|
| A: 50 | B: $-75$ | C: 275 | D: $-30$ | E: 225 |

A8. The time t at which the object is furthest from the starting point is

| | | | | |
|---|---|---|---|---|
| A: 4 | B: 6 | C: 8 | D: 10 | E: 12 |

A9. Evaluate $27^{-\frac{2}{3}}$.

| | | | | |
|---|---|---|---|---|
| A: 9 | B: 1/9 | C: 1/81 | D: 1/3 | E: 1/36 |

A10. Evaluate $\left(2^{-2}\right)^3 / \left(2^{-3}\right)$.

| | | | | |
|---|---|---|---|---|
| A: 8 | B: 1/4 | C: 2 | D: 1/16 | E: 1/8 |

A11. Find the *y*-intercept of $y = 3(10^x) - 4$.

| | | | | |
|---|---|---|---|---|
| A: 6 | B: –4 | C: –1 | D: 4 | E: –3 |

A12. The horizontal asymptote of $y = 3(10^x) - 4$ is $y =$

| | | | | |
|---|---|---|---|---|
| A: 6 | B: –4 | C: –1 | D: 4 | E: –3 |

A13. Let $f(x) = \frac{1}{1+x}$ for $x > 0$. The inverse function, $f^{-1}(x)$ =

| | | | | |
|---|---|---|---|---|
| A: $1+x$ | B: $\frac{1}{x}+1$ | C: $\frac{1}{x}-1$ | D: $x-1$ | E: $\frac{1}{x}$ |

A14. Evaluate $\log_3 \frac{1}{27}$.

| | | | | |
|---|---|---|---|---|
| A: 4 | B: 3 | C: 2 | D: 1 | E: –3 |

A15. Evaluate $2^{2\log_2 5}$.

| | | | | |
|---|---|---|---|---|
| A: 25 | B: 10 | C: 625 | D: 5 | E: 1/10 |

A16. Evaluate $\log_2 40 - \log_2 \frac{5}{2}$.

| | | | | |
|---|---|---|---|---|
| A: 4 | B: 3 | C: 2 | D: 1 | E: –3 |

A17. Let $\log x^2 = \log x - 2\log 2$. Solve for *x*.

| | | | | |
|---|---|---|---|---|
| A: 1/2 | B: 1/4 | C: 2 | D: 1/16 | E: 1/8 |

A18. If one earthquake has a magnitude of 5 on the Richter scale and a second earthquake has a magnitude of 7, how much more intense is the second earthquake?

| | | | | |
|---|---|---|---|---|
| A: 2 | B: 10 | C: 100 | D: 1000 | E: 1/100 |

A19. The quantity $\log_2 100$ is numerically equivalent to

| | | | | |
|---|---|---|---|---|
| A: 50 | B: $\frac{2}{\log 2}$ | C: $\frac{1}{\log 2}$ | D: $\frac{\log 2}{2}$ | E: $\frac{\log 2}{100}$ |

A20. Let $2(e^x) = 1$. Solve for $x$.

| | | | | |
|---|---|---|---|---|
| A: ln 2 | B: 1/ln 2 | C: ln (–2) | D: –ln 2 | E: 1/(2$e$) |

**PART B**
**(20 marks)**
**Show all your work for each question.**

**MARKS**

3 B1. Simplify $\frac{\left(8x^3y^{3/2}\right)^{2/3}}{\left(4x^2y^{4/3}\right)^{1/2}}$ (where $x > 0$ and $y > 0$) as much as possible.

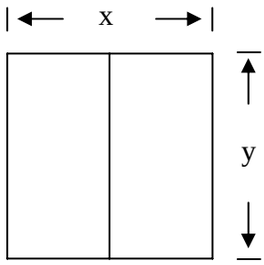
2 B2. Let $\frac{1}{\log_8 a} + \frac{1}{\log_4 a} = \frac{M}{\log_2 a}$ for any a > 0. Find the numerical value for M.

3 B3. Solve for *x* given that $\log_2 x + \log_2 (x+6) = 4$.

4 B4. Let $f(x) = x^3 - 12x + 5$.
Find the absolute maximum and minimum values of $f(x)$ for $-3 \le x \le 0$.

4 B5. Use implicit differentiation to find $\frac{dy}{dx}$ where $x^4 + 3x^3y - y^3 = 10$.

4 B6. A rectangular plot of farmland is divided into two sub plots of equal size and both sub plots are enclosed by wire fencing (as shown in the diagram below). With 1200 m of wire fencing at your disposal, what is the largest total area you can enclose, and what are the corresponding dimensions of the rectangular plot?




y = the length of the rectangular plot in metres

x = the width of the rectangular plot in metres

END