1.

5 marks (a) Evaluate $\displaystyle\int_0^3 \frac{\sqrt{x}}{x^2+x}\,dx$.

5 marks (b) Integrate $\displaystyle\int x\tan^{-1}x\,dx$.

10 marks 2. Evaluate $\int_0^\infty e^{-ax} \cos bx \, dx$, where a and b are positive constants. Carefully explain your work.

10 marks 3. Evaluate $\int_0^1 \ln x \, dx$. Carefully explain your work.

4.

4 marks (a) Give the definition of the Gamma function $\Gamma(x)$.

6 marks (b) Calculate directly, without using any additional properties, the value of $\Gamma(2)$.

5.

6 marks (a) Give the $\epsilon - \delta$ definition of continuity of a function $f(x)$ at a point x_0.

4 marks (b) Use part (a) to prove that the function $f(x) = 3(x-1)^2$ is continuous at the point $x_0 = 1$.

6.

5 marks (a) State the Mean Value Theorem

5 marks (b) Use the Mean Value Theorem to prove the inequality $xe \leq e^x$ for all $x > 1$.

10 marks 7. Use part (b) of Problem 6 to determine whether the improper integral $\int_1^\infty \frac{dx}{x^2 - xe + e^x}\,dx$ converges or not. Do not evaluate the integral.

10 marks 8. Write out the form of the partial fraction decomposition of the function

$$\frac{2x^2 + 6x - 7}{(x^2 + x - 2)^2 (x^2 + 6x + 13)^2}.$$

Do not evaluate the coefficients.

This page is left blank intentionally. It may be used for any answer which you could not fit in the space provided.

Instructor's Name (**Print**)

Student's Name (**Print**)

Student's Signature

THE UNIVERSITY OF WESTERN ONTARIO
LONDON CANADA
DEPARTMENT OF MATHEMATICS

Calculus 1501 First Midterm Examination

Friday, February 8, 2013 7:00 p.m. – 9:00 p.m.

INSTRUCTIONS

1. Do not unstaple the booklet. Do not tear any pages from the booklet.
2. Questions start on Page 1 and continue to Page 8. Questions are printed on both sides of the paper. BE SURE YOU HAVE A COMPLETE BOOKLET.
3. CALCULATORS AND NOTES ARE NOT PERMITTED.
4. SHOW ALL YOUR WORK. Answer all questions in the spaces provided.
5. TOTAL MARKS = 80.

Student Number (**Print**)

Student's Name (**Print**)

FOR GRADING ONLY

PAGE	MARK
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	