UNIVERSITY OF MANITOBA

DATE: December 22, 2005 FINAL EXAMINATION
PAPER # 615 TITLE PAGE
DEPARTMENT & COURSE NO: 136.170 TIME: 2 hours
EXAMINATION: Calculus II EXAMINERS: W. Korytowski, F. Ghahramani

FAMILY NAME: (Print in ink) _____

FIRST NAME: (Print in ink) _____

STUDENT NUMBER: _____

SEAT NUMBER: _____

SIGNATURE: (Print in ink) _____
(I understand that cheating is a serious offense)

Please indicate your instructor and section by checking the appropriate box below:

- ☐ L01 W. Korystowski M,W,F 8:30 - 9:20
- ☐ L02 F. Ghahramani Tues, Thurs 1:00 - 2:20

INSTRUCTIONS TO STUDENTS:

This is a 2 hours exam. **Please show your work clearly.**

No texts, notes, or other aids are permitted. No calculators, cellphones or electronic translators permitted.

This exam has a title pages, 8 pages of questions and also 2 blank pages for rough work. Please check that you have all the pages. You may remove the blank pages if you want, but be careful not to loosen the staples.

The value of each question is indicated in the lefthand margin beside the statement of the question. The total value of all questions is 120 points.

Answer all questions on the exam paper in the space provided beneath the question. If you need more room, you may continue your work on the reverse side of the page, but CLEARLY INDICATE that your work is continued.

Question	Points	Score
1	18	
2	34	
3	14	
4	12	
5	14	
6	8	
7	6	
8	14	
Total:	120	

[8] 1. (a) Find the area of the region bounded by the curves $y = x^2$ and $y = 8 - x^2$.

[10] (b) Find the volume of the solid generated by revolving the region in part (a) about the $x - axis$.

2. Calculate the following integrals:

[6] (a) $\int \frac{e^x}{1+e^{2x}}\, dx.$

[8] (b) $\int sin(2x)e^x dx.$

[10] (c) $\displaystyle\int_1^{\sqrt{3}} \frac{x^3}{\sqrt{4-x^2}}\,dx.$

[10] (d) $\displaystyle\int \frac{x^2+2x+1}{x^3+x^2+x}\,dx.$

[10] 3. (a) Calculate the length of the arc C given by the equation
$y = e^x + \frac{1}{4}e^{-x} \quad (0 \leq x \leq 1)$.

[4] (b) Set up a definite integral for the area of the surface generated by rotating the arc in part (a) about the $x - axis$. DO NOT EVALUATE THE INTEGRAL

4. A curve C has the equation

$$\begin{aligned} x &= t^3 + 3t^2 \\ y &= t^3 - 3t^2 \end{aligned}$$

[8] (a) Find the coordinates of the point(s) on the curve where the tangent line is horizontal and point(s) where the tangent line is vertical.

[4] (b) Set up a definite integral for the length of an arc of the above curve corresponding to $0 \leq t \leq 1$.

[6] 5. (a) Find the area of the region bounded by the curve whose equation in polar coordinates is given by $r = cos\theta - 1$.

[8] (b) Find the length of an arc of the curve in part (a) corresponding to $0 \leq \theta \leq \pi$.

[8] 6. Calculate the following limit:

$$\lim_{x \to 0^+} (1 + sinx)^{\frac{1}{x}}.$$

[6] 7. Find the value of the improper integral

$$\int_0^{\frac{\pi}{2}} \frac{sinx}{\sqrt{cosx}}\, dx.$$

[6] 8. (a) By using the comparison test determine whether the improper integral

$$\int_1^{\infty} \frac{1+|sinx|}{x}\, dx \text{ converges or diverges.}$$

[8] (b) Find the following limit:

$$\lim_{x\to\infty} \frac{1}{x} \int_1^{x} \frac{1+|sint|}{t}\, dt.$$