The University of Manitoba

Math 1710, Applied Calculus 2, Test # 1 February 12, 2008

NAME (PRINT): _____ **STUDENT #:** _____

NAME (SIGNATURE): _____

(I understand that cheating is a serious offense.)

Please indicate your section – lecture time - instructor:

☐ **A01, M/W/F at 8:30 a.m., T. G. Berry**

OR

☐ **A02, Tu/Th at 1:00 p.m., J. J. Williams**

INSTRUCTIONS TO STUDENTS:

Fill out the information requested above (name, number, signature and section).

This is a 1 hour exam. Please show your work **clearly**.

This exam has a title page and 4 pages of questions. Please check that you have all 5 pages.

The value of each question is indicated to the left of the statement of the question. The total value of all questions is 40.

Students are allowed to bring one $8\frac{1}{2}" \times 11"$ sheet of paper with formulae and notes. This page may contain information on ONE SIDE ONLY, must be hand-written (not mechanically reproduced) and must bear the student's name and student identification number. IF YOUR INFORMATION PAGE DOES **NOT** CONFORM TO THESE CRITERIA IT WILL BE CONFISCATED.

IN ADDITION, ELECTRONIC CALCULATORS, CELL PHONES, ELECTRONIC DICTIONARIES, PERSONAL MUSIC PLAYERS AND OTHER ELECTRONIC DEVICES ARE **NOT** PERMITTED.

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 facing page, but CLEARLY INDICATE where your work is continued.

[8] **1.** Evaluate the integral: $\int_0^{\sqrt{2}} \frac{x^3}{1+x^2} dx$. **SHOW ALL YOUR WORK.**

DO NOT WRITE IN THESE COLUMNS		
QUESTION NUMBER	MARK	MAX.
1		8
2		3
3		5
4 (a)		7
4 (b)		5
5		7
6		5
TOTAL		40

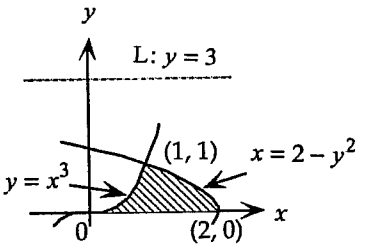
[3] **2.** SET UP, BUT DO NOT EVALUATE, integral(s) to determine the AREA of the region which lies in the first quadrant and is bounded by the curves: $x = 1 + y^2$ and $y = 1$.

[5] **3.** SET UP, BUT DO NOT EVALUATE, integral(s) to determine the LENGTH of that portion of the curve given by: $x = 3 + y^2$, which lies between the points (3, 0) and (7, 2).

4. Consider the shaded region S, bounded by the three curves:

$y = x^3$, $x = 2 - y^2$, and the x-axis,

as shown below:



Let V be the volume of the solid obtained by revolving S about the line L: $y = 3$.

SET UP, BUT DO NOT EVALUATE, integral(s) to determine the volume, V, using:

[7] **(a)** the method of disks/washers:

[5] **(b)** the method of cylindrical shells:

[7] **5.** A building is 300 metres tall. A uniform chain is passed over a pulley at the edge of the roof and it hangs vertically from the top of the building so that a length of 200 metres, having a mass of 800 kilograms, is hanging from the edge of the roof. There is also a 25 kilogram mass attached to the lower end of the chain.
SET UP, BUT DO NOT EVALUATE, an integral to determine the (minimum) amount of WORK done in lifting the end mass up 150 metres by pulling the chain over the pulley. (*Ignore* friction and air resistance.) Note: $g \approx 9.81 \text{ m/s}^2$.

[5] **6.** Consider the plate in the plane bounded by the curves: $y = x^2$ and $y = 4$ (x and y are in metres). SET UP, BUT DO NOT EVALUATE, integral(s) to determine the TOTAL FLUID FORCE exerted on the above plate when it is immersed vertically in water so that its top edge lies 3 metres below the surface of the water.
Note: $g \approx 9.81 \text{ m/s}^2$ and ρ, the density of water $\approx 1{,}000 \text{ kg/m}^3$.

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