Name: _____
Signature: _____
Student Number: _____

Math 101 Section 208 **Test # 2 - Monday, March 8, 2010** **Time: 50 minutes**

Don't worry - just do your best :-)

1. The marks you receive during the term will **likely be scaled** based on the class results on the final exam. Even if it seems difficult, that doesn't mean the term marks will be low!

2. For questions $2-5$, **generous marks** may be given for honest attempts, even if you get stuck - provided you show your work.

Instructions and policies

1. Please print your **name**, **student number**, and provide your **signature** right away, before you attempt any of the problems. **Check** that this booklet contains **ten (10) pages**.

2. **All your work** must be shown for full credit on questons $2-5$. **No work** is required in question 1, and a correct answer will receive 3 points; partial credit of 1 point may be given in question 1 if the answer you provide is wrong.

3. **Unless** a question **specifies otherwise**, you **do not** need to **simplify** your answers.

4. **No calculators, electronic devices, or formula sheets** are allowed during the test.

5. **Ten (10) minutes before the end of the test** period you will be given a verbal notice. After that time, you must **remain seated** until all test papers have been collected.

6. **Exposing your test paper** to others or **looking** at the paper of another student, even if unintentional, will be deemed as **cheating** and subject to disciplinary action.

7. When the test period is over, you will be instructed to put away writing implements. Put away all pens and pencils at this point. **Continuing to write past this instruction** will be **considered cheating**. Please remain seated and pass your test paper down the row to the nearest indicated aisle. You may leave your seat only after all the tests have been collected.

8. A certain **portion of the tests** will be **randomly selected and photocopied**. This is a warning in case an individual modifies their answers and asks for a re-grading, which would be cheating.

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1 **Short Answer** (15 marks: 3 marks per part)

a Evaluate $\int \frac{(x^2+x+1)dx}{\sqrt{x}}$.

b Find the area above $y = x^2$, and beneath both $y = 5x + 6$ and $y = -x + 2$.

c Plot the polar curve $r = \sin(\frac{\theta}{2})$.

d Find the average value of $\sin^2(2x)\cos(3x)$ on $[0, \pi/2]$.

e Express $\lim_{n\to\infty} \sum_{j=1}^{n} \frac{n}{n^2+j^2}$ as a definite integral.

2 **Long Answer** (10 marks)

Find the area of the region that lies inside both curves: $r^2 = \sin(2\theta)$ and $r^2 = \cos(2\theta)$.

3 **Long Answer** (10 marks)

Find

a (5 marks) $\int \frac{x^2+x+1}{x^2+2x+1}dx$

b (5 marks) $\int \frac{xdx}{\sqrt{6-4x^2-2x^4}}$

4 **Long Answer** (10 marks)

A tank is in the form of a right circular cone of base radius 5 m and height 15 m. The cone is situated *pointy-side up*. Find the work done in pumping water *into* the tank *through its base* to a depth of 9 m. Water has a density of 1000 kg m^{-3} and you may approximate the acceleration due to the earth's gravitational field to be 10 m s^{-2}.

5 **Conceptual Question** (5 marks)

State the Mean Value Theorem for Integrals and *provide an example* to show that the result of the theorem does not necessarily hold for functions that are *not continuous*.

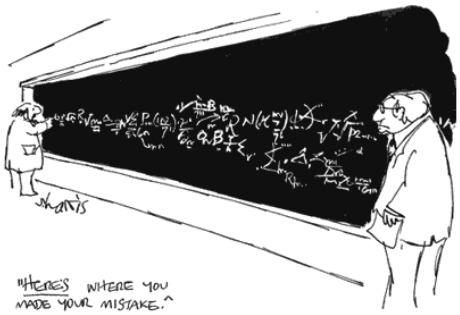

Figure 1: A preview of academic research... This cartoon is complements of S. Harris, with copyright credit from ScienceCartoonsPlus.com.

Bonus a (1 mark)

What is your favourite colour?

Bonus b (1.5 marks)

Find a polar equation of the collection of points the product of whose distances from $(x = -1, y = 0)$ and $(x = 1, y = 0)$ is 1. Find the area enclosed by this curve.

This page is provided for rough work.

Mark breakdown:

Question 1 (out of 15)	_____
Question 2 (out of 10)	_____
Question 3 (out of 10)	_____
Question 4 (out of 10)	_____
Question 5 (out of 5)	_____
Bonus (out of 2.5)	_____
TOTAL (out of 50)	_____