University of Toronto
Faculty of Arts and Science

MAT136H1F Calculus I (B)
Term Test (Make-up Test)
Fall 2014

Duration: 90 minutes
No Aids Allowed

Family Name: _____

Given Name: _____

Student Number: _____

Lecture and Tutorial:

LEC 0101 MWF9	LEC 5101 R6-9	TUT 0101 M3	TUT 0201 R4	TUT 5101 T5	TUT 5201 R5

This exam contains 7 pages (including this cover page) and 5 problems. Check to see if any pages are missing and ensure that all required information at the top of this page has been filled in.

No aids are permitted on this examination. Examples of illegal aids include, but are not limited to textbooks, notes, calculators, or any electronic device.

- **Organize your work.** Write your answers in the space provided. Work scattered over the page without clear ordering will receive very little credit.
- **Justify your answers.** An incorrect answer supported by correct calculations and explanations might still receive partial credit.
- **Need more space?** If you need more space, use the backs of the pages and clearly indicate when you have done this. You can also use the backs of pages for rough-work.

Problem	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
Total:	50	

1. Evaluate the definite and indefinite integrals below.

   (a) (4 points) $\int (3t+2)^9 dt$.

   (b) (3 points) $\int_0^{\pi/2} e^{\cos(x)} \sin(x) dx$.

   (c) (3 points) $\int x\sqrt{x-3} dx$.

2. Evaluate the definite and indefinite integrals below.

(a) (4 points) $\int \frac{x}{(x-1)^2} dx.$

(b) (3 points) $\int_0^{\pi/2} \cos^3(x) \sin^2(x) dx.$

(c) (3 points) $\int \sqrt{2-2s^2}ds.$

3. (a) (2 points) Determine whether $f(x) = x\cos(x)$ is an even function, odd function, both, or neither.

(b) (2 points) Write the average value of $f(x) = x\cos(x)$ on the interval $[0, \pi]$ as an integral.

(c) (4 points) Find the average value of $f(x) = x\cos(x)$ on the interval $[0, \pi]$.

(d) (2 points) Suppose $g(x)$ is a continuous function on the interval $[0, 5]$ that satisfies $\int_0^5 g(x)dx = 2$. The mean value theorem for integrals will say that g must assume what value?

4. Suppose a car travels on a straight road away from Toronto. Let $p(t)$ be its position relative to Toronto (measured in kilometres) at time t (measured in hours). Also suppose its velocity (in kiltometres per hour) at time t is denoted by $v(t)$. Let's assume we have information about the car's velocity, i.e. we know that the function $v(t)$ is given by $v(t) = t^2 e^t$.

   (a) (5 points) Determine the net change in the position of the car from $t = 0$ to $t = 2$.

   (b) (5 points) Define $F(x) = \int_x^{x^2} \sin(s^2) ds$ for $x \geq 1$. Find $\frac{d}{dx} F(x)$.

5. Consider the region R between the two curves $y = \sqrt{x}$ and $y = x$ from $x = 0$ to $x = 1$.

   (a) (5 points) Consider the shape created by rotating the region R around the line $x = -1$. Let its volume be denoted by V_1. Write V_1 as an integral, and explain the method of approximation that gave you the integral.

   (b) (5 points) Consider the shape created by rotating the region R around the line $y = 2$. Let its volume be denoted by V_2. Write V_2 as an integral, and explain the method of approximation that gave you the integral.