VANCOUVER ISLAND
UNIVERSITY

Math 101 Practice Test 1 – Jan 26 2011

name (printed)	*student number*

Instructions:

1. There are **7 pages** (including this cover page) in the test. You will be given **75 minutes** to write the test. Justify every answer, and clearly show your work. Unsupported answers will receive no credit. Read over the test before you begin.

2. You may use a single letter-size "cheat sheet" containing formulae and numerical values. Your cheat sheet must not contain text, definitions or examples. The instructor will have the final decision on what is or is not appropriate for the cheat sheet. Hand in your cheat sheet along with your completed test. **To be considered for grading, your test must include your cheat sheet.**

3. Other than the cheat sheet noted above, no notes or books are to be used during the test. The last page is for scrap work. Put your name on the scrap paper and return it along with your completed test.

4. A basic scientific non-programmable, non-graphing calculator is permitted, however calculators may not be shared.

5. At the end of the test you will be given the instruction to stop writing. **Continuing to write after this instruction is cheating**.

6. **Academic dishonesty:** Exposing your paper to another student, copying material from another student, or representing your work as that of another student constitutes academic dishonesty. Cases of academic dishonesty may lead to a zero grade in the test, a zero grade in the course, and other measures, such as suspension from this university.

question	value	score
1	10	
2	10	
3	10	
4	10	
5	10	
Total	50	

Question 1:

(a)[3] The rate of increase of a growing town's population is determined at five points in time, resulting in the following data:

t (years)	0	0.5	1	1.5	2
$r(t)$ (people per year)	100	110	120	120	130

Give an upper estimate of the population increase over the period $t = 0$ to $t = 2$.

(b)[3] Use three subintervals and right hand endpoints to estimate the area under the graph of $f(x) = \sqrt{x}$ over the interval $[0, 9]$. Round your answer to one decimal. Is your answer an over-estimate or under-estimate of the true area? Explain briefly.

(c)[4] The limit

$$\lim_{n\to\infty} \sum_{i=1}^{n} \left[1 + \sin\left(i\frac{\pi}{n}\right)\right] \frac{\pi}{n}$$

represents the area between the graph of a certain function and the x-axis. Draw the graph and shade the area in question. To get full marks you must correctly identify the function and the interval over which the area is measured.

Question 2:

(a)[4] Find the average value of $f(x) = 4x^3 + \dfrac{2}{x}$ on the interval $[1, e]$.

(b)[3] Compute $F'(1)$ if $F(x) = \displaystyle\int_0^{x^2} e^{\sqrt{t}}\, dt$

(c)[4] Evaluate $\displaystyle\int_{-\pi/2}^{\pi/2} \sqrt{\sin x + 1}\cos x\, dx$.

Question 3:

(a)[3] Evaluate $\displaystyle\int \frac{\tan^{-1} x}{1+x^2}\,dx$.

(b)[4] Suppose $\displaystyle\int_0^5 f'(x)\,dx = 11$, where $f'(x)$ is continuous. If $f(0) = -2$, what is $f(5)$?

(c)[3] The average value of $f(x) = 1 + x$ over the interval $[-2, k]$ is 1. What must be k?

Question 4:

(a)[4] Evaluate $\int \frac{e}{t \ln(t)}\, dt$.

(b)[3] Evaluate $\int \frac{x}{1+x}\, dx$.

(c)[4] Evaluate $\int \sin^2(2x)\, dx$. (Hint: recall that $\sin^2\theta = \frac{1-\cos(2\theta)}{2}$.)

Question 5:

(a)[4] Without evaluating the integral, explain why $\int_{-3}^{0} (x^2 + 3x)\, dx = 3$ can not be correct.

(b)[3] Let $f(x) = \int_{x}^{3x} \frac{1}{t}\, dt$. Show that $f(x)$ is constant on $(0, \infty)$.

(c)[4] Use an area interpretation to evaluate $\int_{0}^{2} |1 - 2x|\, dx$.