MATH 152-D200 Instructor: R. Pyke

Midterm 1, February 3, 2008

Last Name:	
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1. DO NOT LIFT UP THE COVER PAGE UNTIL INSTRUCTED.
2. Clearly explain your answer. No credit will be given for just writing down the answer.
3. If the answer space provided is not sufficient, write your answer on the back of the previous page.
4. Ordinary Scientific Calculators ONLY are allowed.
NO GRAPHING CALCULATORS ALLOWED.
5. **Copying someone else's test, or deliberately exposing written papers to the view of others is forbidden and will result in a score of zero and disciplinary action.**

Question	Score	Max
1		10
2		5
3		6
4		8
5		6
6		8
7		6
8		8
Total		57

(1) [Marks: 10] Find the indefinite integrals (check your answer!) and use them to compute the indicated definite integrals (you do <u>not</u> need to simplify your answer, i.e., you can leave numerical results as square roots, sines or cosines, etc).

(a) $\displaystyle\int \frac{1+x}{\sqrt{x+2}}$

(i) $\displaystyle\int_{-1}^{4} \frac{1+x}{\sqrt{x+2}}\,dx$

(b) $\displaystyle\int \left(-\frac{2}{3}\csc^2 x + \frac{2}{x}\right)$

(i) $\displaystyle\int_{-1}^{-2} \left(-\frac{2}{3}\csc^2 x + \frac{2}{x}\right)\,dx$

(2) [Marks: 5] Evaluate

$$\int_{-1}^{2} |\, 2 \sin 2x| \, dx$$

(3) [Marks: 6] Find the following limit;

$$\lim_{n\to\infty} \sum_{i=1}^{n} 2\left(1+\frac{i}{n}\right) \frac{3^{\left(1+\frac{i}{n}\right)^2}}{n}$$

(4) [Marks: 8] Find the derivatives $f'(x)$ of the following functions.

(a) $f(x) = \int_{e^{3x}}^{2} \tan 3t^2 \, dt$

(b) $f(x) = \int_{2x+1}^{3-x} \frac{1}{1+z^3} \, dz$

(i) Can you find a value for x such that the integral is 0? (for part (b))

(5) [Marks: 6] As a snowball rolls down a hill its radius increases at a rate of $2 + 0.005t^{2/3}$ cm per second, where t is the length of time it has been rolling, measured in seconds. The radius of the snowball is 10 cm at the top of the hill, and the hill is 120 metres long (not 120 metres high!). If the snowball rolls down the hill at a constant speed of 1.5 metres per second, how big is the snowball when it reaches the bottom of the hill?

(6) [Marks: 8] **(a)** Explain why the following inequality is true;

$$\frac{1}{2} \quad \leq \quad \int_0^1 \frac{1}{1+t^3} \quad \leq \quad 1$$

(b) Now find a better estimate than $\dfrac{1}{2} \leq \displaystyle\int_0^1 \frac{1}{1+t^3}$, i.e., find a *larger* value than $\frac{1}{2}$ which is still less than or equal to the value of the integral. Explain your reasoning.

(7) [Marks: 6] Find the area between the curves $y = \sin(\pi x/2)$ and $y = x^2 - 2x$ (make a sketch!).

(8) [Marks: 8] Suppose you wanted to find the volume of the solid obtained by rotating the region bounded by the curves $x = 0,\ x = 9 - y^2$ about the line $x = -1$. Show that you could do this <u>two</u> ways; using discs and using cylinders. <u>Include a sketch</u>.

Just set up the integrals but do <u>not</u> evaluate them.

<u>Using discs</u>:

<u>Using cylinders</u>: