

Simon Fraser University

MATH 155 – MIDTERM 1 (Version A)

Instructor: N.Kouzniak

June 1, 2005

Last Name _____
Given Name(s) _____
Student ID _____
Signature _____

**INSTRUCTIONS**

1. Do not open this booklet until instructed to do so. The booklet contains 6 pages including the cover page.

2. Print your name and student ID in the space provided above.

3. For each question you must **show all your work** unless stated otherwise.

4. No book, paper, or device other than the usual writing instruments, this booklet, and scientific calculators are allowed. **In particular, no graphing/programmable calculators are allowed.**

5. During this examination, speaking to, communicating with, or exposing written papers to the view of other students is forbidden.

6. You may use the back of the previous page for a rough work or if you run out of space.

7. Stop writing when you are instructed to do so. Failure to follow instructions may result in penalties.

Question	Maximum	Mark
1	10	
2	2	
3	2	
4	2	
5	11	
6	10	
7	3	
Total	40	

1. [10 marks] Indicate whether the statement is True or False. Do not evaluate the integrals

#	Statement	T	F
1	$\int \csc^2 x dx = -\cot x + C$		
2	$\sum_{k=1}^n k = \frac{n(n+1)}{6}$		
3	If $f(x)$ is continuous on $[a,b]$ , then the function defined by $F(x) = \int_a^x f(u) du, \quad a \leq x \leq b$ is continuous on $[a,b]$ and differentiable on $(a,b)$ with $\frac{d}{dx} F(x) = f(x)$		
4	$\int_0^1 \frac{dx}{(1+x+x^3)^{1/2}} \leq \int_0^1 \frac{dx}{(1+2x+x^3)^{1/2}}$		
5	$\int_a^b \sqrt{1+x^2} dx = \sum_{k=1}^n \sqrt{1+c_k^2} \Delta x_k$		
6	$0 \leq \int_0^\pi \sin x dx \leq \pi$		
7	$\int_{-1}^1 \frac{dx}{x^2} = -2$		
8	$\int_0^{\pi/2} \cos x dx = \int_0^\pi \cos x dx + \int_\pi^{\pi/2} \cos x dx$		
9	If $f(x)$ is integrable on $[a,b]$ , then $\int_a^b f(x) dx = [\text{area of the region between the graph of } f(x) \text{ and } x\text{-axis}]$		
10	The most general antiderivative of a function $f(x)$ is $F(x)+C$ , where $F(x) = f'(x)$		

2. [2 marks] Compute

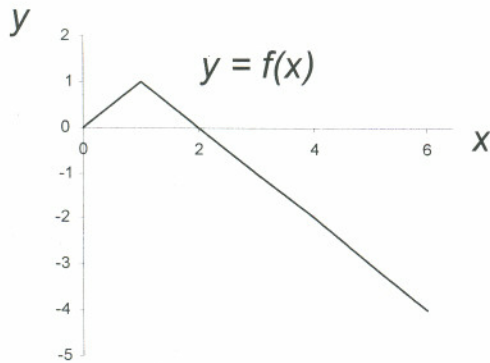
$$\frac{d}{dx} \int_{x^2}^{x^4} e^{3u} du$$

3. [2 marks] Evaluate

$$\sum_{i=1}^{20} (i-1)(i+1)$$

4. [2 marks] Let  $F(x) = \int_0^x f(t) dt$  where the graph of  $y = f(x)$  is shown below.

Find values of  $x$  such that  $F(x) = 0$ .



5. [11 marks total] Express the following quantities in terms of the definite integrals. **DO NOT EVALUATE** the integrals.

- i) The volume of the solid obtained by rotating the region bounded by the curves  $y = \sqrt[3]{x}$ ,  $x = 4y$  in the first quadrant:

1. [3 marks] about the x-axis

2. [3 marks] about the y-axis

- ii) [3 marks] The area A of the region enclosed between the curves  $y = x^2$ ,  $y = (x - 2)^2$  and the line  $y = 0$ .

iii) [2 marks] The average value of  $y = \cot x$  over  $[\pi/4, \pi/3]$

6. [10 marks total] Evaluate the following integrals

a) [2 marks]  $\int \sin x \cos^2 x dx$

b) [4 marks]  $\int_1^2 x \sqrt{x-1} dx$

c) [4 marks]  $\int x \tan^{-1} x dx$

7. [3 marks] Give the partial fraction decomposition of the function (evaluate the constants)

$$f(x) = \frac{5x^3 - 3x^2 + 2x - 1}{x^4 + x^2}$$