

SIMON FRASER UNIVERSITY
DEPARTMENT OF MATHEMATICS

Midterm 1

MATH 155

June 9th, 2003, 8:30-9:20am

Instructor: Adriana Wise

Name: _____ (please print)
family name *given name*

Signature: _____

INSTRUCTIONS

1. DO NOT OPEN THIS BOOKLET UNTIL TOLD TO DO SO.
2. Write your name above in block letters and sign below your name.
Write your student number and family name in the boxes on the back page.
3. For each question write your final answer in the answer box whenever one is provided.
4. This exam contains a formula sheet, 7 pages with a total of 7 questions and this cover page. Once the exam begins please check to make sure your exam is complete.
5. If the space provided for rough work is insufficient you may use the back of the previous page.
6. **No book, paper, or device other than pencils or pens shall be within reach of a student during the examination. In particular, no calculators are allowed.**
7. **During the examination, speaking to, communicating with, or deliberately exposing written papers to the view of, other examinees is forbidden.**
8. **Students observed writing anything after the call to stop writing will be subject to summary penalties.**

- [3] 1. Suppose that $f(1) = 3$, $g(1) = -5$, $f'(1) = 2$ and $g'(1) = 1$. Find

$$\left[(f^2 + g)^{1/2} \right]'(1).$$

ANSWER

SHOW YOUR WORK

- [4] 2. Suppose that the length of a certain organism at age x is given by $L(x)$ (measured in millimeters), which satisfies the differential equation

$$\frac{dL}{dx} = e^{-x/9}, \quad x \geq 0.$$

ANSWER

 $L(x) =$

Length at birth:

Find $L(x)$ if the size of the organism as it gets older approaches 50 millimeters (i.e. $\lim_{x \rightarrow \infty} L(x) = 50$). What is the size of the organism at birth (age $x = 0$)?

SHOW YOUR WORK

[4] **3.** (a) Evaluate the definite integral $\int_0^{\pi/2} \sin x \cos^5 x \, dx$.

ANSWER

SHOW YOUR WORK

[4] (b) Find the indefinite integral $\int x\sqrt{x+3} \, dx$.

ANSWER

SHOW YOUR WORK

[4] (c) Find the indefinite integral $\int x \cos x \, dx$.

ANSWER

SHOW YOUR WORK

- [3] 4. Let $f(x)$ be a continuous positive valued function. Suppose that the average of $f(x)$ on the interval $[1, 4]$ is 7. What is the **area** under $f(x)$ on the interval $[1, 4]$? Justify your answer.

ANSWER

JUSTIFICATION:

- [3] 5. Suppose that $f(4) = 5$ and $1 \leq f'(x) \leq 3$ for all x in $[2, 4]$. Assuming that f is integrable establish the inequality $-1 \leq f(2) \leq 3$.

SHOW YOUR WORK

- [3] 6. (a) Write down the correct form for the partial fraction expansion of

$$\frac{1}{2x^3(x^2 + 9)^2(x^2 - 1)}$$

without making any attempt to evaluate the constants which occur.

ANSWER

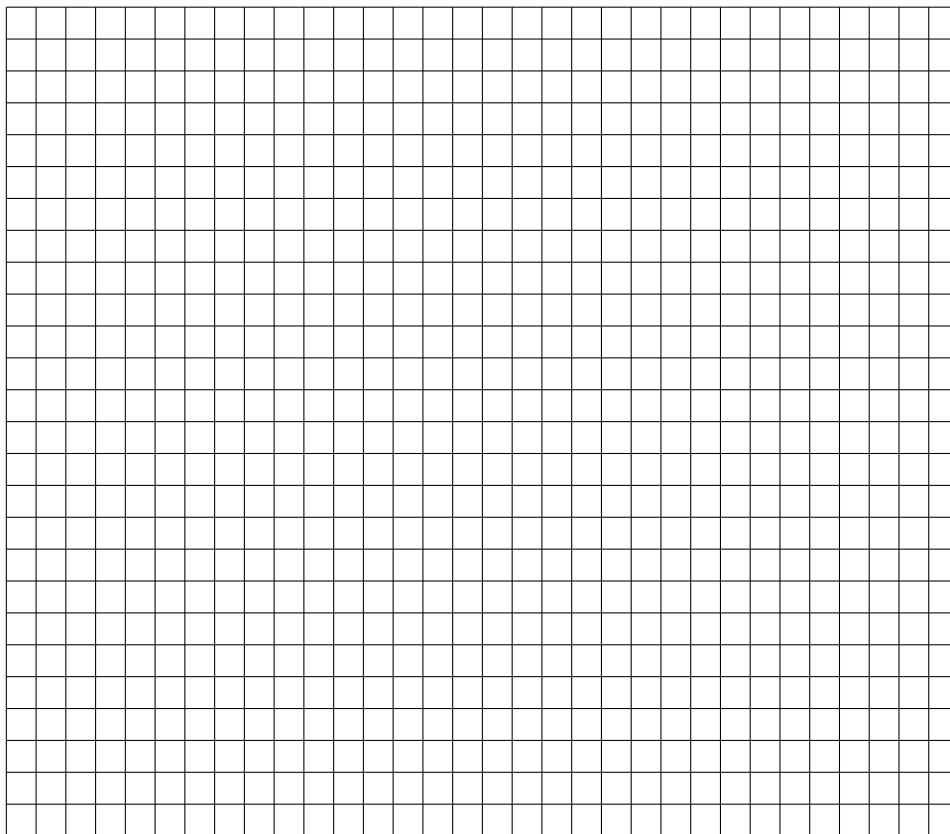
- [4] (b) Evaluate the indefinite integral

$$\int \frac{1}{x(x+1)} dx.$$

ANSWER

SHOW YOUR WORK FOR (b)

- [2] 7. (a) Sketch the region bounded between the graph of $y = \sqrt{x}$, and the lines $x = 0$ and $y = 2$. Identify all intercept points clearly.



- [3] (b) Set up the definite integral that needs to be evaluated to find the area of the region described in part a). **Do not evaluate or simplify the integral.**

ANSWER

SHOW YOUR WORK

- [3] (c) Set up the definite integral that needs to be evaluated to find the volume of the solid obtained by revolving the region described in part (a) about the x -axis. **Do not evaluate or simplify the integral.**

ANSWER

SHOW YOUR WORK

Student number

Family name

DO NOT WRITE BELOW THIS LINE

Question	Maximum	Score
1	3	
2	4	
3	12	
4	3	
5	3	
6	7	
7	8	
Total	40	