

UNIVERSITY OF CALGARY - FACULTY OF SCIENCE
Department of Mathematics and Statistics
FINAL EXAMINATION
Math 253, L01 and L02, Fall 2005

Time 2 hours, NO AIDS, NO CALCULATORS

Surname	Other Names	Lec.	ID

Examination Rules

1. Students late in arriving will not normally be admitted after one-half hour of the examination time has passed.
2. No candidate will be permitted to leave the examination room until one-half hour has elapsed after the opening of the examination, nor during the last 15 minutes of the examination. All candidates remaining during the last 15 minutes of the examination period must remain at their desks until their papers have been collected by an invigilator.
3. All enquiries and requests must be addressed to supervisors only.
4. **Candidates are strictly cautioned against:**
 - (a) speaking to other candidates or communicating with them under any circumstances whatsoever;
 - (b) bringing into the examination room any textbook, notebook or memoranda not authorized by the examiner;
 - (c) making use of calculators and/or portable computing machines not authorized by the instructor;
 - (d) leaving answer papers exposed to view;
 - (e) attempting to read other student's examination papers.

The penalty for violation of these rules is suspension or expulsion or such other penalty as may be determined.

5. Candidates are requested to write on both sides of the page, unless the examiner has asked that the left hand page be reserved for rough drafts or calculations.
6. Discarded matter is to be struck out and not removed by mutilation of the examination answer book.
7. Candidates are cautioned against writing in their answer book any matter extraneous to the actual answering of the question set.
8. The candidate is to write his/her name on each answer book as directed and is to number each book.
9. A candidate must report to a supervisor before leaving the examination room.
10. Answer books must be handed to the supervisor-in-charge promptly when the signal is given. Failure to comply with this regulation will be cause for rejection of an answer paper.
11. If a student becomes ill or receives word of domestic affliction during the course of an examination, he/she should report at once to the Supervisor, hand in the unfinished paper and request that it be cancelled. Thereafter, if illness is the cause, the student must go directly to the University Health Services so that any subsequent application for a deferred examination may be supported by a completed medical statement form. An application for Deferred Final Examination must be submitted to the Registrar by the date specified in the University Calendar.

Should a student write an examination, hand in the paper for marking, and later report extenuating circumstances to support a request for cancellation of the paper and for another examination, such a request will be denied.

12. Smoking during examinations is strictly prohibited.

1. Solve the following SHORT ANSWER problems:

(a) $\int_0^{\infty} 3x^2 e^{-x^3} dx$

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(b) $\int x^2 e^{2x} dx$

2	
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(c) $\int \frac{1}{(4-x^2)^{3/2}} dx$

2	
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$$(d) \int \frac{x^2}{x+1} dx$$

2	
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$$(e) \int \frac{1}{x^3 + 3x^2 + 2x} dx$$

2	
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$$(f) \int \frac{1}{x(x+1)^2} dx$$

2	
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(g) the area enclosed by $y = x^2$ and $y = 2 - x$

2	
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(h) the arclength of the curve $y = \frac{e^x + e^{-x}}{2}$,
 $0 \leq x \leq \ln(2)$

2	
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(i) a particular solution, $y_p(x)$, of the equation
 $y'' + y' + y = \cos(x)$

2	
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2. Find the volume obtained by rotating the plane region enclosed by $y = x$, $y = -2x$ and $y = 2$ about the x -axis.

6	
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3. Find the volume obtained by rotating the plane region enclosed by $y = x^2$ and $y = 2x$ about the axis $y = -1$.

6	
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4. Find the general solution to the equation

5	
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$$\frac{dy}{dx} = \frac{x}{y^2}.$$

5. Solve the initial value problem

5	
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$$\frac{dy}{dx} - \frac{1}{x}y = x^2, \quad y(1) = 2.$$

6. Find the general solution of

5	
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$$y'' - 3y' + 2y = x.$$

7. Find the solution of the initial value problem

5	
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$$y'' + 2y' + y = 0, \quad y(0) = 1, \quad y'(0) = 2.$$