

University of Ottawa
MAT 1332C Midterm Exam

February 15, 2012, Duration: 80 minutes. Instructor: Olga Vasilyeva

Family Name: _____

First Name: _____

DGD 1

DGD 2

DGD 3

DGD 4

Do **not** write your student ID number on this front page. Please write your student ID number in the space provided on the second page.

Take your time to read the entire paper before you begin to write, and read each question carefully. Remember that certain questions are worth more points than others. Make a note of the questions that you feel confident you can do, and then do those first: you do not have to proceed through the paper in the order given.

- You have 80 minutes to complete this exam.
- This is a closed book exam, and no notes of any kind are allowed. The use of cell phones, pagers or any text storage or communication device **is not permitted**.
- Only the Faculty approved TI-30 calculator is allowed.
- The correct answer requires justification written legibly and logically: you must convince me that you know why your solution is correct. Answer these questions in the space provided. Use the backs of pages if necessary.
- Where it is possible to check your work, do so.
- Please do not detach the pages.
- Good Luck!

Student number: _____, Total marks: _____ out of 25

Problem	1	2	3	4	5	6
Marks						

Question 1. Calculate:

a) [2pts] $\int_0^1 \frac{e^z + 1}{e^z + z} dz$

b) [2pts] $\int_1^e \frac{\ln(x)}{x^2} dx$

c) [2pts] $\int \frac{x + 3}{x(x + 2)} dx$

Question 2. Determine whether each integral is convergent or divergent. If the integral is convergent, find its value.

a) [2pts] $\int_1^{\infty} \frac{x}{\sqrt{x^2+1}} dx$

b) [2pts] $\int_0^1 \ln(x) dx$

Question 3.[3 pts] Find the area of the region between the graphs of $f(x) = x^3 - x$ and $g(x) = x^2 - x$.

Question 4.[4 pts] Find the volume of the solid of revolution obtained by rotating the region bounded by the graphs of $f(x) = x^3 + x$ and $g(x) = x^2 + x$ around the x -axis.

Question 5.[4 pts]

Find the general solution of the separable differential equation

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

Question 6.

According to the Newton's Law of Cooling, the temperature of a warm object decreases at a rate proportional to the difference between its temperature and that of its surroundings. Namely,

$$\frac{dH}{dt} = \alpha(H - A)$$

where $H(t)$ is the temperature of the object at time t , α is the proportionality constant, and A is the temperature of the surroundings.

When a murder is committed, the body, originally at 37.6°C , cools according to Newton's Law. Suppose that after three hours the body cools down to 35°C , and that the temperature of the surrounding air is a constant 20°C .

- a) [3 pts] Find the temperature $H(t)$ of the body as a function of time t (in hours) since the murder was committed.

b) [1 pt] If the body is found at 4pm and its temperature is 30°C , when was the murder committed?

additional space