



ÇANKAYA UNIVERSITY

Department of Mathematics and Computer Science

MCS 108 - Mathematics for Business and Economics II

2015-2016 Spring Semester

FIRST MIDTERM EXAMINATION

25.03.2015

ANSWER KEY

STUDENT NUMBER:

NAME-SURNAME:

SIGNATURE:

DURATION: 100 minutes

Question	Grade	Out of
1		30
2		20
3		20
4		15
5		15
Total		100

IMPORTANT NOTES:

- 1) This is a written exam, not a test exam. You should write a DETAILED SOLUTION as we did in class. Show all your work. No points will be given to correct answers without reasonable work.
- 2) Please make sure that you have written your student number, name and signature above.
- 3) Check that the exam paper contains 5 problems.
- 4) Please TURN OFF your cellphones.
- 5) Calculators are NOT ALLOWED.
- 6) It is not allowed to leave the exam during the first 30 minutes.

1) a) (5 pts) Calculate $\int (x^5 + x^4 + x^3 + 1) dx$.

$$\int x^5 dx + \int x^4 dx + \int x^3 dx + \int 1 dx = \frac{x^6}{6} + \frac{x^5}{5} + \frac{x^4}{4} + x + C$$

b) (5 pts) Calculate $\int e^{x+1} dx$.

$$\left. \begin{array}{l} u = x+1 \\ du = dx \end{array} \right\} \text{ so } \int e^{x+1} dx = \int e^u du = e^u + C = \underline{\underline{e^{x+1} + C}}$$

c) (6 pts) Calculate $\int \frac{2x+5}{x+2} dx$.

$$\frac{2x+5}{x+2} = \frac{2(x+2)+1}{x+2} = 2 + \frac{1}{x+2}, \text{ so}$$

$$\int \frac{2x+5}{x+2} dx = \int \left(2 + \frac{1}{x+2} \right) dx = \int 2 dx + \int \frac{1}{x+2} dx, \quad \left(\begin{array}{l} \text{call } u = x+2 \\ du = dx \end{array} \right)$$

$$= 2x + \int \frac{du}{u} = \underline{\underline{2x + \ln|x+2| + C}}$$

d) (8 pts) Calculate $\int_0^3 e^{3x^2+8x} (3x+4) dx$.

$$\int e^{3x^2+8x} (3x+4) dx = \frac{1}{2} \int e^u du \quad \text{when we call } \begin{array}{l} u = 3x^2+8x \\ \frac{du}{2} = 3x+4 \end{array}$$

$$= \frac{1}{2} e^u + C = \frac{1}{2} e^{3x^2+8x} + C$$

So, definite integral will be

$$\int_0^3 e^{3x^2+8x} (3x+4) dx = \left(\frac{1}{2} e^{3x^2+8x} \right) \Big|_0^3 = \frac{1}{2} \left[e^{3 \cdot 3^2 + 8 \cdot 3} - e^{3 \cdot 0^2 + 8 \cdot 0} \right]$$

$$= \underline{\underline{\frac{1}{2} [e^{51} - 1]}}$$

e) (6 pts) If y is a function of x such that $\frac{dy}{dx} = \sqrt{x}$ and $y(0) = 5$, find $y(2)$.

$$\frac{dy}{dx} = \sqrt{x}$$

$$y(x) = \int \sqrt{x} dx$$

$$= \int x^{1/2} dx$$

$$= \frac{x^{3/2}}{3/2} + C$$

$$\boxed{y(x) = \frac{2}{3} x^{3/2} + C}$$

Impose the condition $y(0) = 5$:

$$5 = \frac{2}{3} \cdot 0 + C \Rightarrow \underline{\underline{C = 5}}$$

$$\therefore \boxed{y(x) = \frac{2}{3} x^{3/2} + 5}$$

$$\text{and so } y(2) = \frac{2}{3} (2^{3/2}) + 5 = \underline{\underline{\frac{4\sqrt{2}}{3} + 5}}$$

