## Eskişehir Osmangazi University - Electrical Engineering Department Advanced Calculus 2nd Midterm Examination - Fall 2013

All answers must be written in the appropriate neighborhoods of the questions. Anything written elsewhere will not be graded. Use the back side of the exam sheet if you need scratch paper.

## Question 1.

[25 pts.-no partial credits] Let  $f_1(x) = x$ ,  $f_2(x) = x^2$ ,  $f_3(x) = x + 1$ ,  $f_4(x) = x^2 + 2x$ . True or False? (Write **T** or **F** in the box next to each statement) The set of functions  $\{f_1, f_2, f_3\}$  is linearly independent on  $0 \le x \le 1$ . **T** The set of functions  $\{f_1, f_2, f_3\}$  is linearly independent on  $0 \le x \le 4$ . **T** The set of functions  $\{f_1, f_2, f_4\}$  is linearly independent on  $0 \le x \le 1$ . **F** The set of functions  $\{f_1, f_2, f_3, f_4\}$  is linearly independent on  $0 \le x \le 1$ . **F** The set of functions  $\{f_3, f_4\}$  is linearly independent on  $0 \le x \le 1$ . **F** 

## Question 2.

[25 pts] Given that C is the positively oriented circle |z - 2| = 5, evaluate the following integral(express the results in cartesian form; answers should be free of trigonometric, logarithmic, hyperbolic and exponential terms):

$$\int_C \frac{1}{z(z-2)^3} dz$$

Residue at 0:  $-\frac{1}{8}$ . Residue at 2:  $\frac{1}{8}$ . Thus the integral equals  $2\pi i(-\frac{1}{8}+\frac{1}{8})=0$ 

Question 3. -

[25 pts] Find the solution y satisfying

$$\frac{dy}{dt} = -y\frac{1+2t^2}{t}, \ y(1) = 2$$

Separable d.e.!  $y(t) = \frac{2}{t}e^{1-t^2}$  or  $y(t) = \frac{1}{t}e^{1.69-t^2}$  or  $y(t) = \frac{5.43}{t}e^{-t^2}$ 

## Question 4. -

[25 pts] Find a general solution to

$$\frac{d^2y(x)}{dx^2} + 3\frac{dy(x)}{dx} - 10y(x) = 5x^2$$

 $y(t) = c_1 e^{2x} + c_2 e^{-5x} - \frac{1}{2}x^2 - \frac{3}{10}x - \frac{19}{100}$ 

Good Luck A. Karamancıoğlu