Eskişehir Osmangazi University - Electrical Engineering Department
Advanced Calculus
2nd Midterm Examination - Fall 2012

All results 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.

1. Given that $C: \ |z-1|=10$ is oriented positively, evaluate:

$$\int_C \frac{e^{3z}}{(z-0.5)^2}dz \ \textbf{Ans.} \ 2\pi i(3e^{3z})_{z=0.5} = 6\pi e^{1.5}i = 84.47i$$

2. Given that $D: \ |z-3|=1$ is oriented positively, evaluate

$$\int_D \frac{e^z}{\sin z}dz \ \textbf{Ans.} \ 2\pi i(\frac{e^z}{\cos z})_{z=\pi} = -2\pi i e^{\pi} = -145.39i$$

3. Find a general solution for $\frac{dy}{dx}+3y = xe^{-3x}$.
Ans. $ce^{-3x}+\frac{1}{2}x^2e^{-3x}$

4. Express the following differential equation in the normal form:

$$\frac{d^3y}{dx^3}+\frac{dy}{dx}+2y = e^x$$

$$\begin{array}{rcl} \dot{x}_1 & = & x_2 \\ \textbf{Ans.} \quad \dot{x}_2 & = & x_3 \\ \dot{x}_3 & = & -2x_1-x_2+e^x \end{array}$$

5. Find a general solution for

$$\begin{array}{rcl} \frac{dy}{dt}+\frac{dx}{dt}+x & = & 0 \\ \frac{dy}{dt}+x & = & 0 \end{array}$$

Ans. $x=-c_2, \ y=c_1+c_2t$

Good Luck
A. Karamancıoğlu