January 24, 2013

# IŞIK UNIVERSITY, MATH 203 FINAL EXAM

| **First Name:** | **Last Name:** | | | | **Row#:** | | | |
|---|---|---|---|---|---|---|---|---|
| **Student ID:** | **Q1** | | **Q2** | | **Q3** | | **Q4** | |

**Q1.** (13p) Solve the initial value problem

$$y'' + 4y = u_\pi(t), \qquad y(0) = y'(0) = 0.$$

**Q2.** (12p) Solve the initial value problem

$$y'' + 4y' + 13y = e^{t^2-1}\delta(t-1), \qquad y(0) = 0, \quad y'(0) = 1.$$

**Q3.** (11p) Determine a suitable form for a particular solution of the differential equation

$$y^{(4)} + 2y''' + 2y'' = 3e^t + 2te^{-t} + e^{-t}\sin t + t.$$

**Q4.** (14p) Solve the system of equations

$$\mathbf{x}' = \begin{pmatrix} 9 & 5 \\ -6 & -2 \end{pmatrix} \mathbf{x}.$$

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| Student ID: | Q5 | | Q6 | | Q7 | | Q8 | |

**Q5.** (11p) Find and classify the critical points of the function $f(x, y) = x^2y - 2x - 4y^2$.

**Q6.** (13p) Find the general solution of the differential equation $y'' - 2y' + y = \frac{e^t}{1+t^2}$.

**Q7.** (15p) Verify Green's theorem for the integral $\oint_C x^2dx + (y^2 + x^2)dy$ where $C$ is the positively oriented boundary of the quarter disk $x^2+y^2 = 1$ in the first quadrant.

**Q8.** (11p) Solve the initial value problem $xy' - y = x^2 \tan x, \;\; y(2\pi) = 1.$