King Fahd University of Petroleum & Minerals
Department of Math. & Stat.

Exam I - Math 568 (142) Time: 2 hours

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Name: ID #

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Please show all work. No credit for a result without work

Problem 1	/7
Problem 2	/14
Problem 3	/14
Total	/35

Problem # 1. (7 marks) Solve the problem

$$\frac{u_x}{x} - \frac{u_y}{y} = 4u, \ x \neq 0, \ y \neq 0$$
$$u(x, x) = 1$$

Problem # 2. (14 marks) Use the characteristic method to find **two** solutions of

$$u_x u_y = u, \qquad u(x, 2x) = \frac{9}{4}x^2$$

Problem # 3. (14 marks) Let

$$u_{xx} - 2e^y u_{xy} + e^{2y}\left(u_{yy} + u_y\right) = 0$$

a. Show that the PDE is parabolic

b. By a convenient change of variable, reduce it its canonical form

c. Find the solution $u(x, y)$ and its domain of definition, if $u(0, y) = -y$ and $u_x(0, y) = 2e^y$.