

MATH 406

Dr. Salma M. Aboras Al-Tuwairqi

Additional Exercises

Sheet1

I. Classify the following PDE:

1. $z^2 z_{xx} - z_y = \cos z$.
2. $x^2 z_x + y^2 z_y - z_{xy} = 2xy$.
3. $x - y z_x^2 - z_{xy} = 1$.
4. $x - y z_x^2 + 2z_y = 4y$.
5. $x^2 z_{yy} - y z_{xx} = \tan z$.
6. $z_x + z_y^2 - z_{xx} = 4$.
7. $z_x - z_x z_y - z_y = 0$.
8. $z z_x + z_{xy} = z^2$.
9. $z_{xy} - z_x^2 + z_y^2 - \sin z_x = 0$.
10. $\frac{z_y}{z_x} = x^2$.

II. Give two examples of linear, quasi-linear and non-linear PDEFO.

III. Show that $z(x, t) = f(x - ct) + g(x + ct)$ is a solution of $z_{tt} = c^2 z_{xx}$ for any twice differentiable functions f and g of one variable. c is a positive constant.

IV. Show that $z(x, y) = \ln \sqrt{x - x_0} + \ln \sqrt{y - y_0}$ satisfies Laplace's equation $z_{xx} + z_{yy} = 0$ for all pairs (x, y) of real numbers except (x_0, y_0) .