

## MAT 239 (Differential Equations) Handout on Classification of Differential Equations

Consider the differential equation:  $\frac{dQ}{dt} = -kQ$

- \_\_\_\_\_ What is the dependent variable?
- \_\_\_\_\_ What is/are the independent variable(s)?
- \_\_\_\_\_ Is this an ODE or a PDE?
- \_\_\_\_\_ Is the DE linear?
- \_\_\_\_\_ What is the order of the DE?
- \_\_\_\_\_ Is  $Q = 3e^{kt}$  a solution of the DE? If not, can you guess a solution?

Consider the differential equation:  $(1 - x^2)y'' - 2xy' + 2y = 0$

- \_\_\_\_\_ What is the dependent variable?
- \_\_\_\_\_ What is/are the independent variable(s)?
- \_\_\_\_\_ Is this an ODE or a PDE?
- \_\_\_\_\_ Is the DE linear?
- \_\_\_\_\_ What is the order of the DE?
- \_\_\_\_\_ Is  $y = x$  a solution of the DE? If not, can you guess a solution?

Consider the differential equation:  $u_t + uu_x = 0$

- \_\_\_\_\_ What is the dependent variable?
- \_\_\_\_\_ What is/are the independent variable(s)?
- \_\_\_\_\_ Is this an ODE or a PDE?
- \_\_\_\_\_ Is the DE linear?
- \_\_\_\_\_ What is the order of the DE?
- \_\_\_\_\_ Is  $u = 0$  a solution of the DE? If not, can you guess a solution?

Consider the differential equation:  $\frac{d^2\theta}{dt^2} = -\frac{g}{L}\sin(\theta)$

- \_\_\_\_\_ What is the dependent variable?
- \_\_\_\_\_ What is/are the independent variable(s)?
- \_\_\_\_\_ Is this an ODE or a PDE?
- \_\_\_\_\_ Is the DE linear?
- \_\_\_\_\_ What is the order of the DE?
- \_\_\_\_\_ Is  $\theta = \frac{1}{2}gt^2$  a solution of the DE? If not, can you guess a solution?