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

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

_____ 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 soluton?

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 soluton?

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 soluton?

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

_____ 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 soluton?