Worksheet 1/12/2026

1) Classify the following equations. Are they ODEs or PDEs? Is it an equation or a system? What is the order? Is it linear or nonlinear, and if it is linear, is it homogeneous, constant-coefficient? If it is an ODE, is it autonomous?

a) $\frac{\partial^2 v}{\partial x^2} + 3\frac{\partial^2 v}{\partial y^2} = sin(x)$

b) $\frac{d^7 F}{dx^7} = 3F(x)$

c) $x'' + tyx' = 0,\ y'' + txy = 0$

d) $\frac{dx}{dt} + cos(t)x = t^2 + t + 1$

e) $y'' + 8y' = 1$

f) $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial s^2} + u^2$

2) Solve $y' = x^2 - x,\ y(0) = 2.$

3) Solve $y'' = \sin(2x),\ y(0) = 1, y'(0) = 2.$

4) Solve $y' = \frac{1}{x^2-1},\ y(0) = 1.$

5) Solve $y' = e^y$.