Math 240 - Quiz 1

Name _____

August 24, 2023

Score _____

Show all work to receive full credit. Supply explanations when necessary. This quiz is due August 29.

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1. (4 points) State whether each equation is ordinary or partial, linear or nonlinear, give its order, and say which variable is dependent.

   (a) $\dfrac{dp}{dt} = kp(P_0 - p)$

   (b) $8\dfrac{d^4y}{dx^4} = x(1-x)$

   (c) $\dfrac{\partial N}{\partial t} = \dfrac{\partial^2 N}{\partial r^2} + \dfrac{1}{r}\dfrac{\partial N}{\partial r} + kN$

   (d) $\sqrt{1-x}\,\dfrac{d^2x}{dt^2} + 2t\dfrac{dx}{dt} = 0$

2. (2 points) Show that $x^2y + y^2 = c$ is an implicit solution of $2xy\,dx + (x^2 + 2y)\,dy = 0$.

Turn over.

3. (3 points) Solve the initial value problem: $\dfrac{dy}{dx} = \dfrac{1}{1-x^2}, \quad y(3) = \ln 8$

4. (1 point) This problem may be challenging so it's only worth one point.

Find a differential equation for the family of circles passing through the origin with centers on the line $y = x$.

Your final answer should contain only x's and y's, no other parameters or constants.