Print your name: _____

Answer each question completely. You must justify your answers to get credit. Even a correct answer with no justification will get no credits.

1. Consider the ordinary differential equation $x^2y' = y$.

(a) What is the order of the ODE? (No justification needed.) (1 pt)

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(b) Verify that $y(x) = Ce^{-1/x}$ is a solution to the ODE for any value of the constant C. (6 pts)

$y' = Ce^{-1/x} \cdot \frac{1}{x^2}$

$LHS = x^2y' = x^2 \cdot \left(Ce^{-\frac{1}{x}} \cdot \frac{1}{x^2}\right)$

$= Ce^{-\frac{1}{x}} = y = RHS$ ✓

(c) Find a solution to the initial-value problem $x^2y' = y$, $y(1) = 1$. (You may use part (b) even if you did not solve it.) (3 pts)

$y(1) = Ce^{-1/1} = Ce^{-1} = 1$

$\Leftrightarrow C = e$

Answer: $y(x) = e \cdot e^{-\frac{1}{x}} = e^{1-\frac{1}{x}}$.