MA 214
1/22/2023
Quiz 1
Version A

Full name: _____

Student ID number: 9_____

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1. (6 points) For each ODE below, determine its *order*, then place a checkmark if it is linear.

	Order	Linear?
$(y')^2 + y = t$	1	No b/c $(y') \cdot (y')$
$2y - 3y't = 4yt$	1	Yes
$\frac{d^2y}{dt^2} - 5t^{10} = 2\cos(3t)$	2	Yes
$y''' = \frac{(t-1)^2}{5y-2}$	3	No b/c $y''' \cdot y$

2. (8 points) Solve the initial value problem.

$$y' = 3y^2 t, \quad y(0) = 10$$

Method of separation of variables for nonlinear

1st order ODEs

$\frac{dy}{dt} = 3y^2 t \implies \int \frac{dy}{y^2} = \int 3t\,dt$, Note : $\frac{1}{y^2} = y^{-2}$, $\frac{1}{y} = y^{-1}$. Then,

using the opposite of the Power law : $\int y^{-2}\,dy = -y^{-1} + C_1$

and $\int 3t\,dt = \frac{3}{2}t^2 + C_2 \implies -y^{-1} = \frac{3}{2}t^2 + C$, $C = C_2 - C_1$

$\implies y^{-1} = -\frac{3}{2}t^2 + C$, where $-C = C$. Then, $y(t) = \dfrac{1}{-\frac{3}{2}t^2 + C}$

Since $y(0) = 10 = \dfrac{1}{0 + C} \implies C = \frac{1}{10}$.
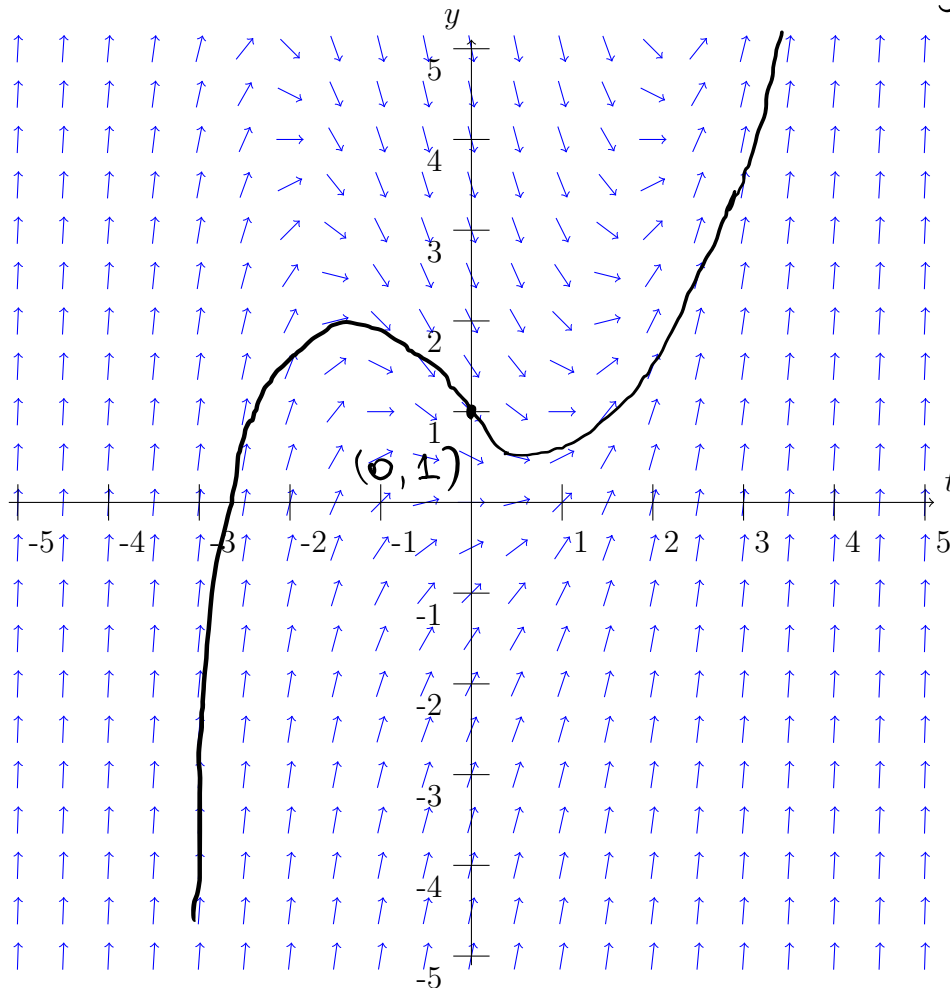
3. (3 points) Circle the ODE that corresponds with the following slope field.

a) $y' = 3 - t$

b) $y' = y + ty$

c) $y' = t(2-y)^2$

(d) $y' = t^2 - y$ b/c when $y=0$, $y' = t^2 > 0$ (positive slope along t-axis)

4. (3 points) Sketch a solution curve through the slope field above, that passes through the point $(0, 1)$. Be sure to draw the curve both to the left and to the right. Be precise.