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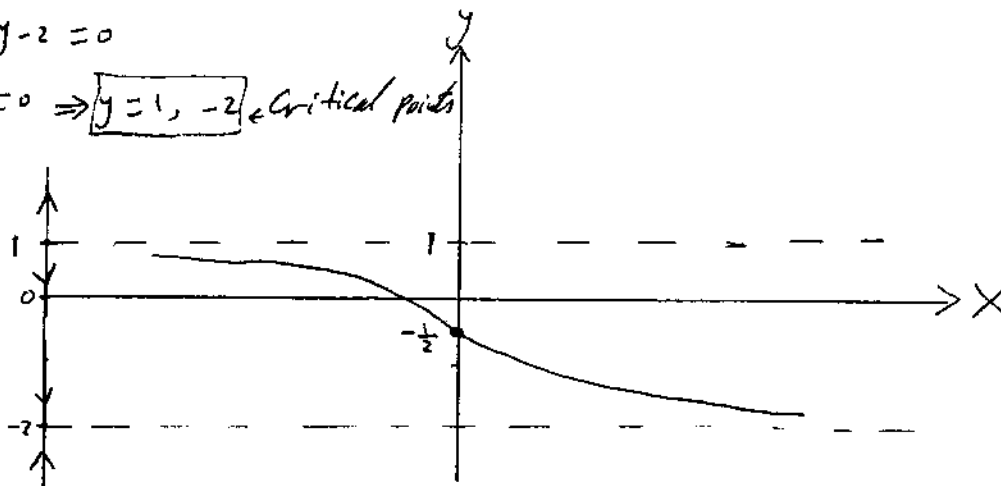
Name: _____ I.D. # _____ Section # ____

1. Consider the autonomous first order differential equation $\dfrac{dy}{dx} = y^2 + y - 2$, with

the initial condition $y(0) = -\dfrac{1}{2}$. Sketch the graph of the solution.

$f(y) = y^2 + y - 2 = 0$

$(y-1)(y+2) = 0 \Rightarrow \boxed{y = 1, -2} \leftarrow$ Critical points

2- Solve the following initial value problem:	3- Solve the following DE:
$x\dfrac{dy}{dx} + 4y = 2x$, $y(1) = -4$	$x\dfrac{dy}{dx} = \dfrac{e^y}{xy}$
$\dfrac{dy}{dx} + \dfrac{4}{x}y = 2$	$x^2 y\,dy = e^y\,dx$
$I.F. = e^{\int \frac{4}{x}dx} = e^{4\ln|x|} = e^{\ln|x|^4} = x^4$	$\dfrac{y\,dy}{e^y} = \dfrac{dx}{x^2}$
$\dfrac{d}{dx}[yx^4] = 2x^4$	$\int y e^{-y}\,dy = \int \dfrac{dx}{x^2}$
$yx^4 = \dfrac{2}{5}x^5 + c$	$-ye^{-y} - e^{-y} = -\dfrac{1}{x} + c$
$y = \dfrac{2}{5}x + c x^{-4}$	$ye^{-y} + e^{-y} = \dfrac{1}{x} + c$
$y(1) = -4 \Rightarrow -4 = \dfrac{2}{5} + c$	
$\Rightarrow c = -\dfrac{22}{5}$	
$\therefore$ the Solution is	
$y = \dfrac{2}{5}x - \dfrac{22}{5}x^{-4}$	