KFUPM MATH202 Quiz#1 Sec. 13

Name Solution. Sr.#

Show all your work

Q1. Given that $y = \frac{ce^x}{1+ce^x}$, c areal constant is one parameter family of solution of DE $\frac{dy}{dx} = y(1-y)$. Find a singular solution for this DE.

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Sol: $y=1$ is a singular solution.

$\frac{dy}{dx} = 0$, $y(1-y) = 1(1-1) = 0$ So $y=1$ is a solution

but $y=1$ is not a member of family solution $y = \frac{ce^x}{1+ce^x}$ 5

there is no value of $c \to y=1$.

Q2. Find the values of m so that function *curve* $y = x^m$ is a solution of DE

$$xy'' + 2y' = 0$$

$y' = mx^{m-1}$, $y'' = m(m-1)x^{m-2}$

$\to x(m(m-1)x^{m-2}) + 2mx^{m-1} = 0 \Rightarrow m(m-1)x^{m-1} + 2mx^{m-1} = 0$

$(m(m-1)+2m)x^{m-1} = 0 \to m^2 - m + 2m = 0 \to m^2 + m = 0$

$m(m+1) = 0 \to m = 0$ or $m = -1$

Q3 Find a region R in the *xy*-plane on which the IVP

$$(4-y^2)y' = x^2, \quad y(x_0) = y_0$$

has a unique solution for every $(x_0, y_0) \in R$

$y' = \frac{x^2}{4-y^2} = f(x,y)$ 2 $\to f_y = \frac{2x^2y}{(4-y^2)^2}$ 2 are continuous 2

in any region $y < -2$, $-2 < y < 2$, or $y > 2$ 4

so unique solution in any region $y < -2$, $-2 < y < 2$ or $y > 2$