Name: Flori Kusari Homework #10 Date: 14/11/2023

Problem 10.1: Find general solutions of the following differential equations:

(a) $(xy^2+x)dx+(y-x^2y)dy$

$(xy^2+x)dx+(y-x^2y)dx=0$

$x(y^2+1)dx+y(1-x^2)dy=0$

$$y=\pm\sqrt{e^{2c_1}-e^{2c_1}x^2-1}$$

(b) $xyy'=1-x^2$

$xy\,dy=(1-x^2)dx$

$$y=\pm\sqrt{2\ln(x)-x^2+c_1}$$

(c) $yy'=\frac{1-2x}{y}$

$y\,dy=\frac{1-2x}{y}dx$

$$y=\sqrt[3]{3x-3x^2+c_1}$$

(d) $y'=10^{x+y}$

$\frac{1}{10^{x+y}}dy=dx$

$$y=-\frac{\ln(-10^x-c_1)}{\ln 10}$$

BRUNNEN

Problem 10.2: Find the solution of the initial value problems:

(a) $y' \sin(x) = y \ln(y)$, $y\left(\frac{\pi}{2}\right) = e$

$y' \sin(x) = y \ln(y) \Rightarrow y = e^{c_1 \tan\left(\frac{x}{2}\right)}$

$y = e^{\tan\left(\frac{x}{2}\right)}$

(b) $y' = \frac{1+y^2}{1+x^2}$, $y(0) = 1$

$\frac{1}{1+y^2}\,dy = \frac{1}{1+x^2}\,dx$

$y = \tan(\arctan(x) + C) \Rightarrow y = \tan\left(\arctan(x) + \frac{\pi}{4}\right)$

(c) $y - xy' = b(1 + x^2 y')$, $y(1) = 1$

$y = -\frac{b c_1 x}{1+bx} + b$

$y = -\frac{b^2 x - x}{1+bx} + b$

BRUNNEN

THE END