$[0(a)]$ 

$$
\frac{dy}{dx} = y^{2/3}, \quad y(\circ) = 2 \quad \text{d} \quad (x_0, y_0) = (0, 2)
$$

Here 
$$
f(x,y) = y
$$
  
\n
$$
\frac{\partial f}{\partial y} = \frac{2}{3}y^{-1/3} = \frac{2}{3} \cdot \frac{1}{y^{1/3}}
$$

Note that f is continuous  
everywhere, by 
$$
\frac{\partial f}{\partial y}
$$
 is  
not continuous when  $y \le d$ 



Let R be the  
rectangular defined by  
rectangular 15y 63.  
-15x51 and 15y 63.  
Then, f and 
$$
\frac{\partial f}{\partial y}
$$
 are  
then, f and  $\frac{\partial f}{\partial y}$  are  
continuous in R.  
Corbaryous in the

$$
\begin{array}{ccc}\n\sum_{D_J} & \text{Yicar} & \text{or} \\
\int_{D_J} & \text{Yicar} & \text{or} \\
\int_{D_J} & \text{Poisson} & \text{or} \\
\end{array}
$$

 $V = Y, y(z) = 0$ <br>x  $\frac{dy}{dx} = y, y(z) = 0$  $(X_{o}/Y_{o})=(2,0)$  $x \frac{dx}{dy} = y$  $y(z) = 0 \quad 4$  $\frac{dy}{dx} = \frac{y}{x}$ This can be re-written as  $\overline{d\overline{x}}$ his can be  $xe^{-1}$ <br>Let  $f(x,y) = \frac{y}{x}$ .  $x = 0$ Then,  $\frac{\partial f}{\partial y}=\frac{1}{x}$ . Note that f and  $\frac{\partial f}{\partial y}$ are continuous  $\begin{array}{ccc}\n-9) & 16 \\
-9) & 16\n\end{array}$ <br>  $A \text{ be } 16 - \text{which as } \frac{dy}{dx} = \frac{9}{x}$ <br>  $(x,y) = \frac{9}{x}$ <br>  $(x,y) = \frac{9}{x}$ <br>  $(x,y) = \frac{9}{x}$ <br>  $(x,y) = \frac{9}{x}$ <br>  $(x=0)$ <br>  $x=0$ <br>  $x=0$ <br>  $x=0$ everwhere except when <sup>X</sup> <sup>=</sup> 0. Let <sup>R</sup> be the rectangle given by  $1\leq x\leq 5$ , given by  $1 \leq x \leq 5$ , in R -Ky  $x = 0.$ <br>  $x = 0$ Then, by Picand's theorem there exists a unique solution there initial value problem<br>to the initial value problem On some interval containing  $x_{0} = 2$ . tr a unique solution<br>aftial vulue problem<br>interval containing Xo=2.



 $y' - y = x, y(1) = 2$ (1)(2)<br>
y' - y = x, y(1) = 2<br>
We have<br>
y' = x + y, y(1) = 2  $(x_{0},y_{0})=(1,2)$  $y = x + y$ ,  $y(1) = 2$ Let  $f(x,y) = x+y$ . Then,  $\frac{\partial f}{\partial y}=1$  $f$  and  $\frac{\partial f}{\partial y}$  are continuous everywhere.  $\frac{1}{2}\frac{1}{2}$  $\begin{array}{ccc} 1 & a \land a & \overline{a} \overline{g} & \overline{g} & \overline{g} & \end{array}$  we the entire  $xy-p$  lane. Let K ne<br>Then, f und  $\frac{\partial f}{\partial y}$  o<br>Continuous in R. hen,<br>- an<br>- et<br>Lont  $sinve$ <br>  $sinwe$ <br>  $cose$ <br>  $sinwe$ Lontinuous in R.<br>Then, by Picards theorem there exists <sup>a</sup> unique solution to the initial some value problem on  $\chi$ <sub>o</sub>= \. olution to the internet<br>ralue problem un son<br>interval I containing



①(a)	
(4-y <sup>2</sup> ) y <sup>1</sup> = x <sup>2</sup> , y <sup>1</sup> = 0	
This can be re-writhta	
y' = $\frac{x^2}{4-y^2}$ , y <sup>1</sup> = 0	
Then,	$\frac{x^2}{2!} = x^2(4-y^2)^{-1}$
Then,	$\frac{x^2}{2!} = x^2(4-y^2)^{-1}$
and,	$\frac{3!}{2!} = -x^2(4-y^2)^2(-2y)$
and,	$\frac{3!}{2!} = -x^2(4-y^2)^{-2}$
and,	$\frac{3!}{2!} = 2$
and,	$\frac{3}{2!} = 2$
and,	$\frac{3}{2!} = 2$
even, and,	$\frac{3}{2!} = 2$
even, we get what by	
Let, R be defined by P	
Then, f and, by P	
Then, f and, by P	
From, R. So, by P	
Then, f and, by P	
and, f and f and g and cofin's	
1	
1	
1	
1	
1	
1	
2	
2	



Let y = Cx. Then, y'<sup>=</sup> <sup>c</sup> Thus,  $xy' = xc = y$ .  $SO<sub>q</sub>$  y =  $C \times$ xc=y.<br>solves xy'= y.  $|S(b)|$  $\frac{2(6)}{\epsilon}$ <br>Let  $f(x) = x$  of  $(c=1$  from above) Let  $f_2(x) = 2x + (c-2)$  from above) we know that  $f_1$  and  $f_2$ Then from part (a) both solve Xy  $\prime = y$ . noth solve  $xy - y$ <br>Further,  $f(c) = 0$  and  $f_z(c) = 2 \cdot 0 = 0$ . Thus, f,  $\begin{array}{ccc} \n(a) - 0 & \dots & \dots & \dots \\ \n0 & 1 & 1 & 1 \end{array}$ initial value problem  $\begin{aligned} \int \text{value } P \text{(s} b^{1} \text{e}^{m} \\ \times y' &= y \text{ y } y^{1} \text{y}^{1} \text{$ Thus, Thus, this initial value problem does<br>not have a vnique solution.

 $|(3)(a)|$ 

2 Let  $y = c \times$ . Then,  $= 2CX$ Thus,  $X\frac{dy}{dx} = x(2cx) = 2cx^2 = 2y$ <br>Thus,  $X\frac{dy}{dx} = x(2cx) = 2cx^2 = 2y$ Z  $\int_{\Omega}$  ,  $\int_{\Omega}$  ,  $\int_{\Omega}$  =  $C \times$  $S_{\circ}$ (2CX) = 2CX = 4J<br> $S_{\circ}$  lues  $X_{\circ}^{\circ}$  X  $X_{\circ}^{\circ}$  $(3)(b)$  $Let f(x) = 3x^2 + (c = 3 + cm)$ above) Let  $f_2(x) = -x^2 + (c = -1)$  from above) Let  $f_z(x) = -x$  and  $f_z$ <br>Then from partial we know that  $f_1$  and  $f_z$  $b$ oth solve  $x\frac{dy}{dx} = 2y$ . noth solve  $\lambda dx$ <br>Further,  $f(c)=3(c)^2=0$  and  $f_2(c)=0$ <br>Further,  $f(c) = 3(c)^2 = 0$  and  $f_2(c) = -1$  $0^2 = 0$ Thus, f,  $\begin{array}{ccc} \n(a) - 3107 & b & c \\
 a & b & c \\
 c & d & d\n\end{array}$ initial value problem  $\int \frac{1}{a} \int \frac{1}{a} e^{-\frac{1}{2} \left( \frac{1}{a} \right)^2} e^{a} \times \frac{dy}{dx} = 2y$ ,  $y(0) = 0$ . Thus, Thus, this initial value problem does<br>not have a vnique solution.