Math 4B:
Section 2, Jan 11th. Time:

Solve the following IVP. Sketch their solutions and determine approximately the interval of existance for each.

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$$y' = (1-2x)y^2 \tag{1}$$
$$y(0) = -1/6 \tag{2}$$

$y'\bar{y}^2 = 1-2x$

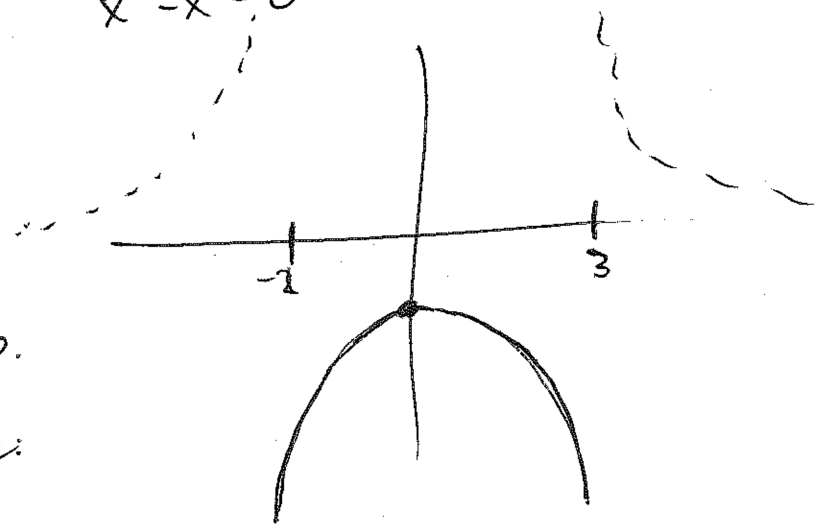
$\int \bar{y}^2 \, dy = \int 1-2x \, dx$

$-y^{-1} = x - x^2 + c$

use IC:

$-(-6) = 0 + c \Rightarrow c = 6.$

$y = \dfrac{1}{x^2 - x - 6} = \dfrac{1}{(x-3)(x+2)}$



Interval of existance:
$t \in (-2, 3)$

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$$y' = (3x^2 - e^x)/(2y-5) \tag{3}$$
$$y(0) = 1 \tag{4}$$

$(2y-5)y' = 3x^2 - e^x$

Integrate

$y^2 - 5y = x^3 - e^x + c$

use I.C.

$1 - 5 = 0 - 1 + c$

$c = -3$

Plot with computer

$\Rightarrow$

Interval of existance

$\approx (-1.4, 4.6)$

Solve the following IVP.

- $$y' + 2y = te^{-2t} \quad (5)$$
  $$y(1) = 0 \quad (6)$$

$\mu(t) = e^{2t}$

$e^{2t}y' + 2e^{2t}y = t$

$[e^{2t}y]' = t$

$e^{2t}y = \frac{t^2}{2} + c$

Use I.C.:

$c = -1/2$

$y = (\frac{t^2}{2} - \frac{1}{2})e^{-2t}$

- $$ty' + (t+1)y = t \quad (7)$$
  $$y(\ln 2) = 1, \qquad t > 0 \quad (8)$$

$y' + (1 + \frac{1}{t})y = 1$

$\mu(t) = e^{t + \ln t} = te^{t}$

$te^{t}y' + (t+1)e^{t}y = te^{t}$

$[te^{t}y]' = te^{t}$

$te^{t}y = (t-1)e^{t} + c$

use I.C.

$c = 2$

$y = 1 - \frac{1}{t} + \frac{2}{te^{t}}$