Unit 4 Lesson 5

- A first order autonomous (non-linear) system is of the form

$$\dot{x} = f(x, y)$$
$$\dot{y} = g(x, y)$$

- Obviously this encompasses linear systems, but this can also describe (for example)

$$\dot{x} = \sin(x) + \cos(y)$$
$$\dot{y} = 2x + y$$

or other weird things.

- Critical points of this system are defined as where

$$f(x_0, y_0) = 0 = g(x_0, y_0)$$

for given x_0, y_0.

Example Problems

1: $1 - x + y$

$-(y + 2x^2)$

$1 - x - 2x^2 = 0$

$2x^2 + x - 1 = 0$

$(2x - 1)(x + 1) \Rightarrow x = \frac{1}{2}, -1 \Rightarrow y = \frac{-1}{2}, -2$ corresponding