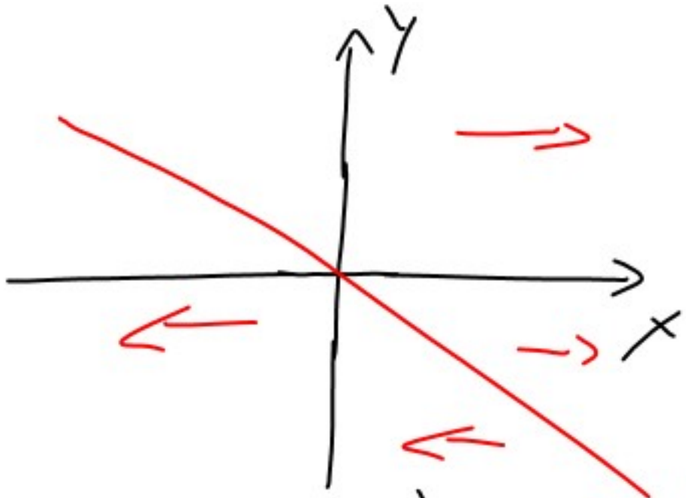
$\dot{x} = 3x + 5y$

$\dot{y} = 2x + 2y$

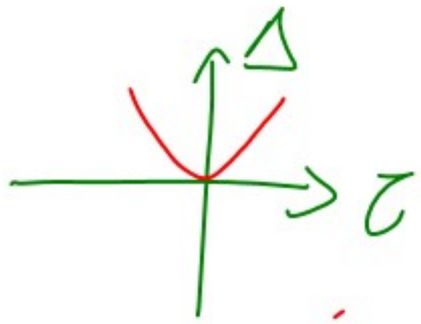
$\tau = 5$

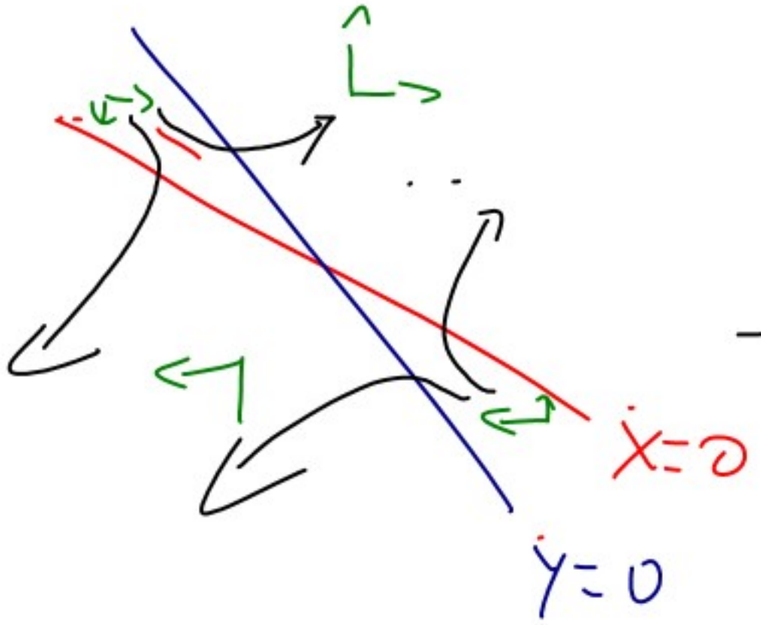
$\Delta = -4$

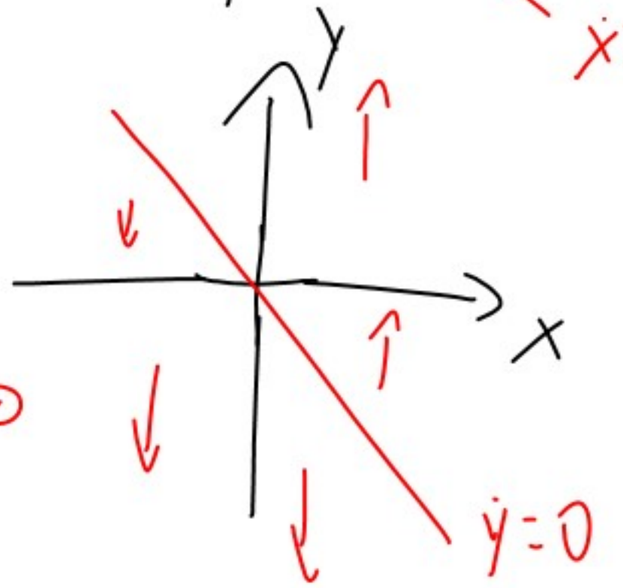


$\dot{x} = 0$

$y = -3x/5$



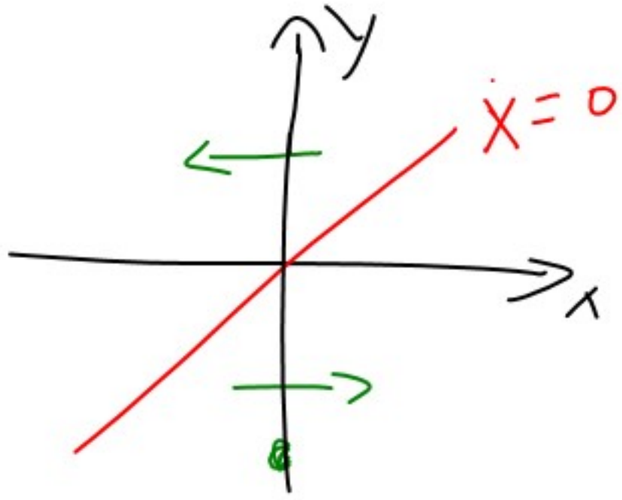




$\dot{y} = 0$

$y = -x$

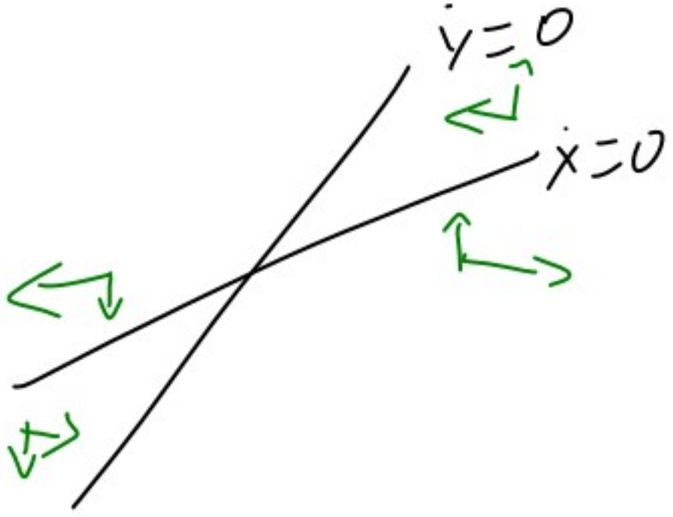
$$\begin{pmatrix} 3 & -2 \\ 4 & -1 \end{pmatrix}$$

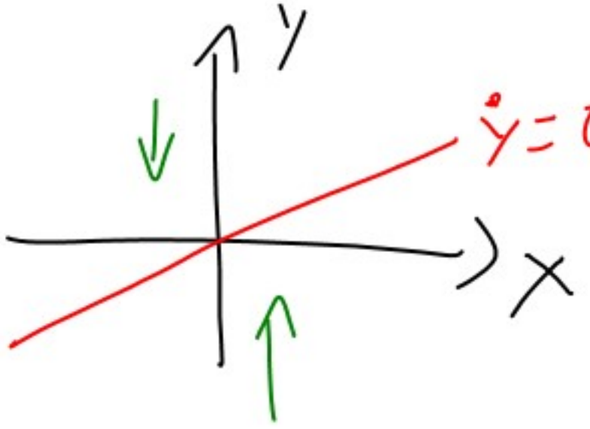


$\dot{x}=0$

$y=3/2x$

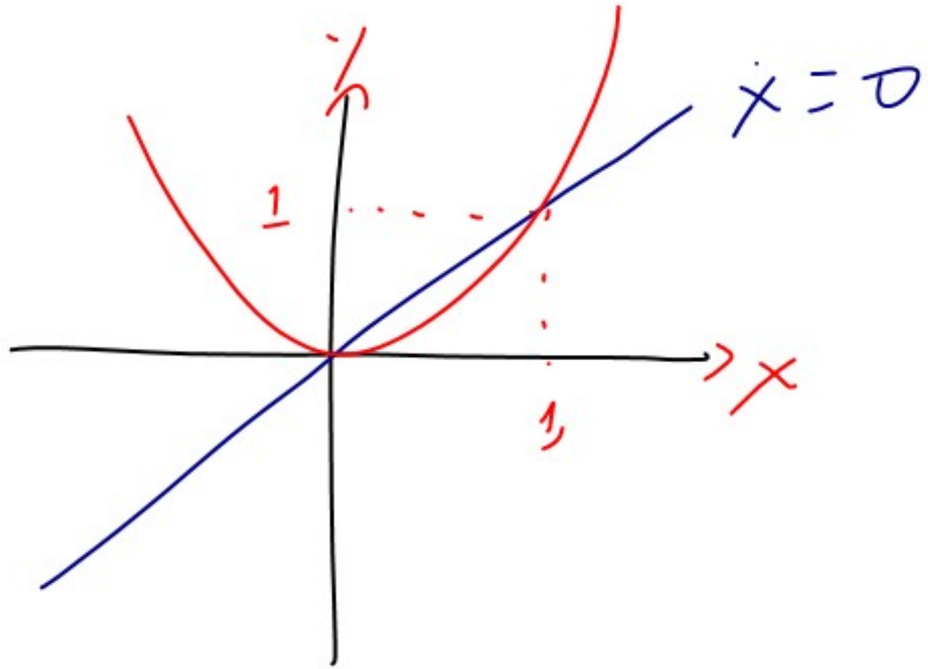
$$\lambda_{1,2} = \frac{2}{2} \pm \frac{\sqrt{2^2-4\Delta}}{2}$$



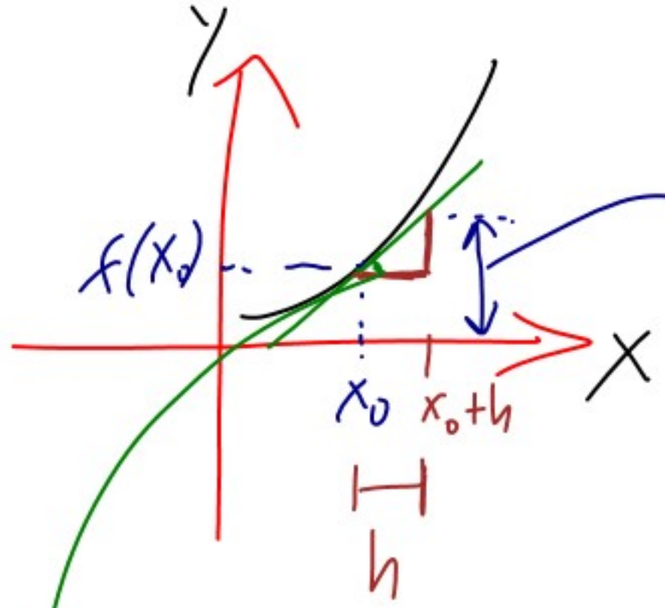


$$\dot{x} = -(x - y)$$

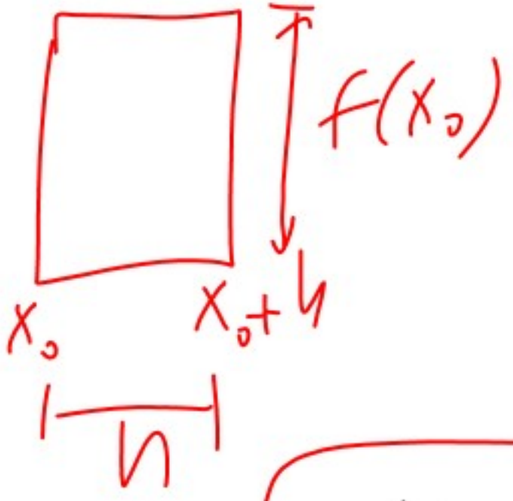
$$\dot{y} = -(x^2 - y)$$

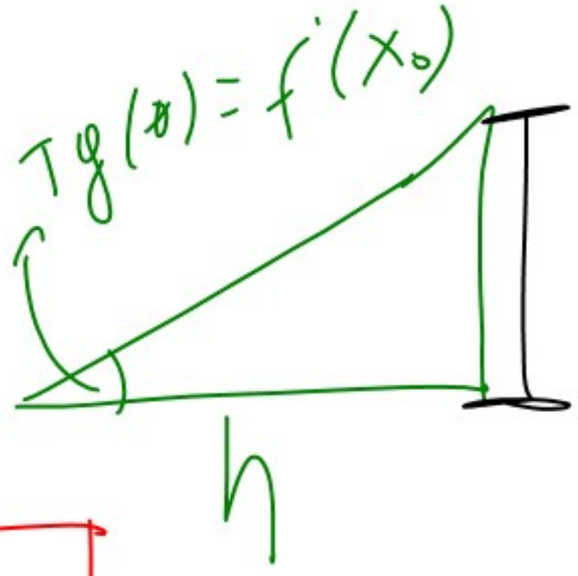


$y = f(x)$



Approx: $f(x_0+h$





$$Tg\theta = f'(x_0)$$

$$f(x_0+h) \simeq f(x_0) + h \cdot f'(x_0)$$

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

$$f(x_0+h_x, y_0+h_y) \simeq f(x_0,y_0) + h_x \frac{\partial f}{\partial x}(x_0,y_0) + h_y \frac{\partial f}{\partial y}(x_0,y_0)$$

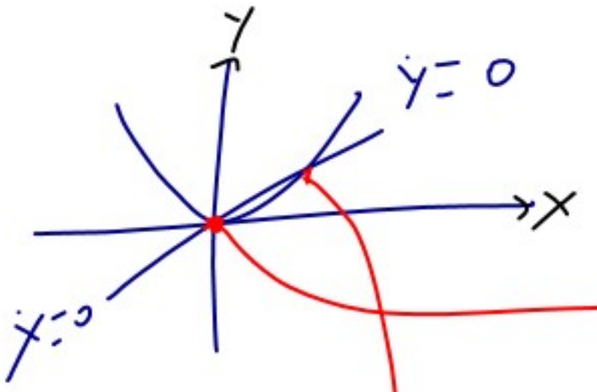
$$g(x_0+h_x, y_0+h_y) \simeq g(x_0,y_0) + h_x \frac{\partial g}{\partial x}(x_0,y_0) + h_y \frac{\partial g}{\partial y}(x_0,y_0)$$

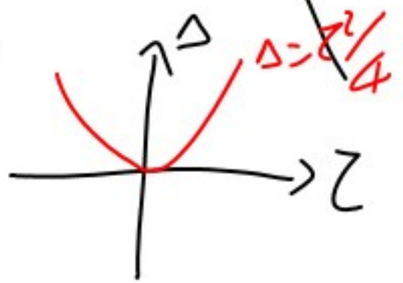
$$\begin{pmatrix} \dot{x} \\ \dot{y} \end{pmatrix} \simeq \begin{pmatrix} f(x_0,y_0) \\ g(x_0,y_0) \end{pmatrix} + \begin{pmatrix} \frac{\partial f(x_0,y_0)}{\partial x} & \frac{\partial f(x_0,y_0)}{\partial y} \\ \frac{\partial g(x_0,y_0)}{\partial x} & \frac{\partial g(x_0,y_0)}{\partial y} \end{pmatrix} \begin{pmatrix} h_x \\ h_y \end{pmatrix}$$

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

$$\dot{y} = g(x,y) = x^2 - y$$

$$\left.\begin{pmatrix} \frac{\partial f}{\partial x} & \frac{\partial f}{\partial y} \\ \frac{\partial g}{\partial x} & \frac{\partial g}{\partial y} \end{pmatrix}\right|_{\substack{x=x_0 \\ y=y_0}} = \begin{pmatrix} 1 & -1 \\ 2x & -1 \end{pmatrix}$$





(0,0)

$$\begin{pmatrix} 1 & -1 \\ 0 & -1 \end{pmatrix}$$

ζ = 0 Δ = -1

(1,1)

$$\begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix}$$

ζ = 0 Δ = 1