

$$\mu = 0$$

2.3

a)

$$\begin{aligned} \dot{x} &= -4y - x^3 \\ \dot{y} &= 4x + 2y^3 \end{aligned} \quad (1) \quad \Rightarrow \quad \omega = 4$$

$$\begin{aligned} \dot{x} &= y - x^2 \\ \dot{y} &= -x + 2x^2 \end{aligned} \quad (2) \quad \Rightarrow \quad \omega = -1$$

$$\begin{aligned} \dot{x} &= -\omega y + f(x, y) \\ \dot{y} &= \omega x + g(x, y) \end{aligned}$$

b)

$$\begin{aligned} \Rightarrow f_{(1)} &= -x^3 \\ g_{(1)} &= 2y^3 \end{aligned}$$

$$\begin{aligned} f_{(2)} &= -x^2 \\ g_{(2)} &= 2x^2 \end{aligned}$$

2.3c

System 1.

$$f_{xxx} = \frac{\partial^3}{\partial x^3} -x^3 = -6 \quad g_{yyy} = 12$$

$$f_{xyy} = 0$$

$$f_{xy} = 0$$

$$g_{xxy} = 0$$

$$g_{xy}(f=0, f_{yy}) \neq f_{xy} = 0$$

$$f_{xx} = -6x \quad g_{xx} = 0$$

$$f_{yy} = 0$$

$$g_{yy} = 12y$$

$$\Rightarrow a = \frac{-6 + 12}{16} = \frac{-6}{16} = \frac{3}{8}$$

System 2.

$$f_{xxx} = 0 \quad g_{yyy} = 0 \quad f_{xyy} = 0 \quad g_{xxy} = 0$$

$$f_{xy} = 0 \quad f_{xx} = -2 \quad f_{yy} = 0 \quad g_{xy} = 0 \quad g_{xx} = 4$$

$$g_{yy} = 0$$

$$\Rightarrow 16a = \frac{1}{-1} - (-2 \cdot 4)$$

$$\Rightarrow a = \frac{-8}{16} = -\frac{1}{2}$$