MECH 6313-Quiz 2 | Jonas Wagner | 2021-02-24 | 1/

1)
$$\dot{x} = \underbrace{\begin{bmatrix} -1 & 3 \\ 1 & 0 \end{bmatrix}}_{A} x \qquad x \in \mathbb{R}^2$$

From Bendixon's Critera, it can be proved that a system has no periodic orbits in a region if its divegnence does not $=0$ and doest chang sign...

$$\nabla \cdot A = Tr(A) = -1 + 0 \;\&\; = -1 \;\forall x$$

Alternativly,

$$\lambda\{A\} = \frac{-1 \pm \sqrt{13}}{2},$$ which is stable and not complex... Decays to origin

$\boxed{\text{Zero}}$

2) center

$$A = \frac{\partial f_a}{\partial x}\Big|_{\substack{x=\bar{x}=0 \\ y=\bar{y}=0}} = \begin{bmatrix} y & x \\ 1-\frac{x^2}{2!} & -2 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 1 & -2 \end{bmatrix} \rightarrow \lambda = 0, -2$$

Next step is find invarient manifold...

Ran out of time...

can't say anything about marginal stability explicity...