

Exercises to prepare the Seminar Test

- 1) Find the flow of $\dot{x} = -3(x-21)$.
 - 2) a) Find a solution of the form $x_p = a \cos t + b \sin t$ of $x'' + x' + x = 2 \cos t$.
b) Find the unique solution of the IVP $x'' + x' + x = 2 \cos 2t$, $x(0) = 0$, $x'(0) = 0$.
 - 3) Find a polynomial solution of $x' = -2x + 7t^2$.
 - 4) Find the general solution of
a) $x' + \frac{1}{t}x = e^{-3t}$; b) $x' + 3t^2x = -1$.
 - 5) We consider the scalar dyn. system $\dot{x} = x - 2x^3$.
Find its equilibria and study their stability using the linearization method. Represent the phase portrait.
Find $\varphi(t, 0)$. Describe the properties of $\varphi(t, 0.2)$ and $\varphi(t, 20)$.
 - 6) Specify the type and stability of the linear system $\dot{x} = x + y$, $\dot{y} = -2x + 4y$.
 - 7) Find a global first integral of $\dot{x} = -7y$, $\dot{y} = 9x$.
Represent its phase portrait.
 - 8) Find the equilibria and study their stability for $\dot{x} = -x + xy$, $\dot{y} = -2y + 3y^2$.
- + similar exercises from the lists uploaded in Teams.