

The homeworks will be graded statistically.

The problems with numbers are from the textbook: *Nonlinear Dynamics and Chaos*, by Steven H. Strogatz, Perseus Books Group, 2001.

This is the last homework!

1. Problem 2.2.2
2. Problem 2.3.3, part b
3. Problem 3.1.2
4. Problem 3.4.9
5. Use a scaling transformation to minimize the number of parameters in the equation

$$my'' + 2by' + ky = \cos(\omega_0 t) - y^3.$$

6. Problem 4.1.4
7. Problem 5.2.6
8. Problem 6.1.5
9. Show that the equation

$$u'' + u = \alpha + \epsilon u^3$$

is conservative. Here α and ϵ are parameters.

10. Problem 7.1.5. Also draw a phase portrait.
11. Problem 7.6.3
12. Problem 8.1.11
13. Solve the difference equation

$$y_{n+2} - y_{n+1} - 2y_n = 2^n, \quad y_0 = 1, y_1 = -1.$$

14. What type of fixed point does the Lorenz system have at $(0, 0, 0)$ for $\sigma = 10$, $b = 8/3$, $r = 28$? Use the Lorenz equations on p.311 of the book.
15. Plot the bifurcation diagram for the map

$$x_{n+1} = r(x_n^2 - x_n^4).$$