

MATH 134: HOMEWORK 0

Due Wednesday, January 6th

Questions followed by * are to be turned in. Questions without * are extra practice. At least one extra practice question will appear on each exam.

Question 1* (Strogatz, Section 1.2)

Consider the ordinary differential equation which describes a swinging pendulum

$$\ddot{y} + \frac{g}{L} \sin(y) = 0 ,$$

where y is the angle of the pendulum from vertical, g is the acceleration due to gravity, and L is the length of the pendulum.

- (a) Define x and $f(x)$ so that the equation may be rewritten in the form $\dot{x} = f(x)$.
- (b) What is the dimension of the system $\dot{x} = f(x)$?

Question 2* (Polking, Section 2.2)

Find the solution to the following ODE

$$\begin{aligned} \dot{x} &= \lambda x , \\ x(0) &= x_0 . \end{aligned}$$

Question 3 (Polking, Section 2.2)

Find the solution to the following ODE, where $k > 0$,

$$\begin{aligned} \dot{x} &= -k(x - A) , \\ x(0) &= x_0 . \end{aligned}$$