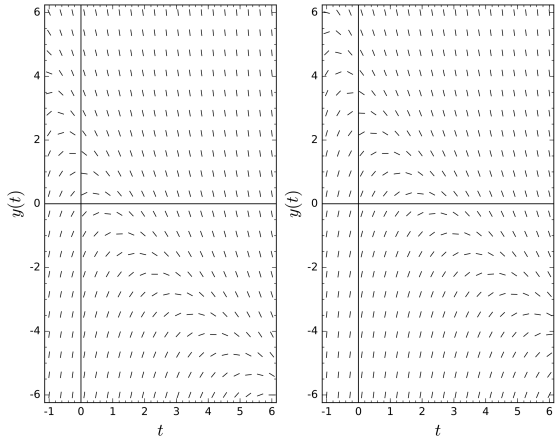
Due: Thursday October 5th, 2023, 1pm

[AWH] Arfken, George B and Weber, Hans J and Harris, Frank E Mathematical methods for physicists: a comprehensive guide *Academic press*, 2011.

1. Exercise 7.2.1 in [AWH]
2. Exercise 7.2.3 in [AWH]
3. Exercise 7.2.13 in [AWH]
4. Exercise 7.2.14 in [AWH]
5. Exercise 7.2.15 in [AWH]
6. Let $y : [0, \infty) \to \mathbb{R}$ be solution to the differential equation

$$\frac{dy}{dt} = -y - t + e^{-t}, \qquad y(0) = -2.$$

Find: a) y, b) $\lim_{t\to\infty} y(t)$. c) Which one of the two below is the correct direction field to the differential equation ? Draw on that direction field the solution curve y.



7. Let $P : [0, \infty) \to \mathbb{R}$. Write down the differential equation that P in each of the following cases (no need to solve).
   (a) Let $P(t)$ be the size of a population in Chilka lake of Hilsa fish with t measured in days. The rate of population increase is proportional to the size of the population. The population increases by 2% per day. Furthermore, 100 Hilsa are harvested each day. Write down a differential equation for the number of fish in lake.
   (b) Suppand wants to buy a Tesla-Space vehicle plans to spend 20000 rupees per month to pay off a 30-year loan. Suppose that the interest rate is 4% compounded continuously. Let P(t) be the amount, in rupees, owed at time t years.