

HW1, Math 454

1. The initial mass of a certain species of fish is 7 million tons. The mass of fish, if left alone, would increase at a rate proportional to the mass, with a proportionality constant of 2/yr. However, commercial fishing removes fish mass at a rate of 15 million tons per year. (a) When will all fish be gone? (b) If the fishing rate is changed so that the mass of fish remains constant, what should the rate be?

2. For the equation $y'' + 4y = 0$. (a) Write it as a set of first order equation. (b) Draw the solution satisfying $y(0) = 1, y'(0) = 0$ in phase space. (c) How about the solution satisfying $y(0) = 0, y'(0) = 1$?

3. Solve the given set of differential equations $\begin{cases} x_1' = x_1 - x_2 \\ x_2' = 4x_1 - 3x_2 \end{cases}$

4. page 40: 2.4.1; 2.4.4; 2.4.5; 2.5.4;

5. page 41: 2.5.5; 2.5.6;

6 page 42: 2.7.4; 2.7.6.