Linear Algebra Homework Two

College of the Atlantic

Due Friday January 18, 2019

This assignment is complete.

Please include a cover sheet for this assignment.

Chapter 1.3:

1. 5
2. 7[1]
3. In class we considered the logistic differential equation. Here we'll examine a modification of that equation:
$$\frac{dP}{dt} = 0.5(P - \frac{P}{100}) - 10 \; . \tag{1}$$
   Since P describes a population, P is never negative. We are interested only in solutions for $t \geq 0$.

   (a) Sketch the slope field for this differential equation. I'd suggest using the desmos tool that is on the Resources page on the course web site. You might have to fiddle around with the axes and zoom-level in Desmos for a bit to get a useful plot.

   (b) Use the slope field to describe the long-term behavior of the population. Does the value of the population at $t = 0$ matter?

   (c) What is the biological or practical interpretation of the number 10 in Eq. (1)?

4. Repeat parts (a) and (b) of the above question, but with the following, slightly different, differential equation:
$$\frac{dP}{dt} = 0.5(P - \frac{P}{100}) - 20 \; . \tag{2}$$

Chapter 1.4:

1. 2
2. 13
3. 22
4. 35
5. 49
6. 51

Chapter 1.5:

1. 3
2. 14

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[1]I've reproduced the two slope field figures on the last page of this pdf. You can print this out and draw your curves on the figures if you wish.

5. $\dfrac{dy}{dx} = y - x + 1$

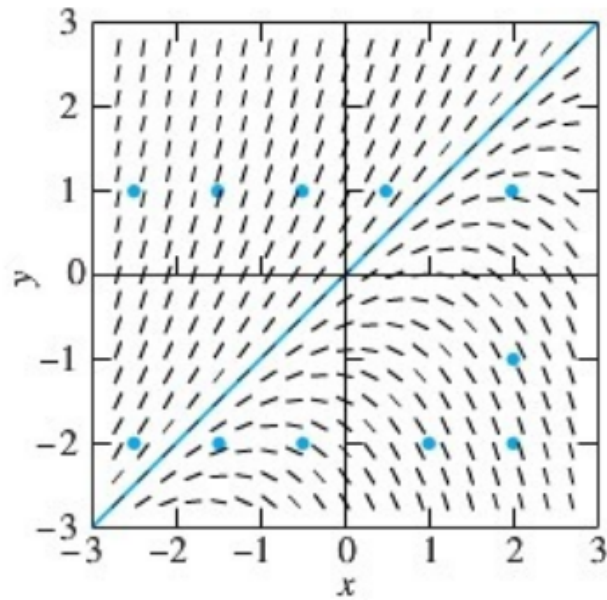Figure 1: The slope field for problem 5 from Chapter 1.3.
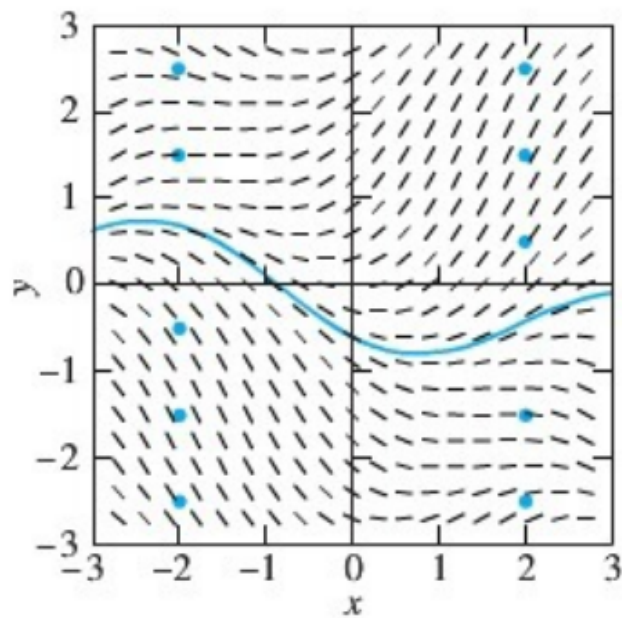
7. $\dfrac{dy}{dx} = \sin x + \sin y$

Figure 2: The slope field for problem 7 from Chapter 1.3.