Homework 7
Due Tuesday, February 26

Instructions: write up solutions to all problems below. Neatness counts: be sure to follow guidelines for homework in the syllabus.

Reading Assignment: 5.5 (for real this time).

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1. Chapter 5.2, # 10. Explain your solution.
2. Chapter 5.2, # 12. Explain your solution.
3. Chapter 5.3, # 2. (This is the graph of $\frac{dx}{dt}$ vs. x. Use it to determine equilibria and their stability. Note that they use x instead of y as the state variable.)
4. Chapter 5.3, (a) # 4, (b) # 6.
5. Chapter 5.3, (a) # 8, (b) # 10.
6. Exploring the case where the stability test is inconclusive. (a) Do Chapter 5.3, Problem 12. (b) Answer the same questions, but for the DE
$$\frac{dx}{dt} = x^3.$$
7. As we have seen, many DE's have parameters in them, and it is crucial to see how the equilibria and their stability change depending on parameters. For the differential equation
$$\frac{dx}{dt} = ax - x^3.$$
with a a parameter
   - For $a > 0$, find the equilibria as functions of a. Assess their stability.
   - For $a = 0$, find the equilibria and assess the stability.
   - For $a < 0$, find the equilibria and assess the stability. [Hint: watch your square roots.]

Practice Problems for the Midterm

Do not turn these problems in! They are for you to practice. These problems may not be comprehensive, but they should give you a good idea of what will be on the exam.

1. Review all the homework problems, making sure you can do them *on your own* without any help from me, friends, or notes.

2. Chapter 4.6, # 19 - 22, 35, 39, 40.

3. Chapter 4.7, # 5- 10.

4. Supplementary Problems, Page 417, # 8.

5. Supplementary Problems, Page 491, # 1, # 6.