Math 3F03, Fall 2014
Assignment 1

This assigment is due on **Monday, September 29**, in class at the beginning of lecture. **Late assigments will not be graded.**
You must show your work and justify your assertions carefully in order to receive full credit.
Page references refer to the course textbook, *Differential Equations, Dynamical Systems, and an Introduction to Chaos* by Hirsch, Smale, and Devaney, Third Edition.

1.) Page 16, exercise 1.

2.) Page 16, exercise 2.

3.) Page 17, exercise 5.

4.) Page 18, exercise 12.

5.) Page 37, exercies 2.

6.) Page 37, exercise 3.

7.) Page 38, exercise 14.

8.) Suppose $\lambda = \alpha + i\beta$ is a complex eigenvalue of a 2×2 matrix A with real entries, having corresponding eigenvector V. Show that the complex conjugate $\bar{\lambda} = \alpha - i\beta$ is also an eigenvalue of A, and that its corresponding eigenvector is $\bar{V}$, the vector whose entries are the complex conjugates of the entries of V.

9.) Suppose a 2×2 matrix A with real entries has a complex eigenvalue $\lambda = \alpha + i\beta$ with coresponding eigenvector V. Then the complex-valued function $e^{\lambda t}V = X(t)$ solves the system $X' = AX$. Write $X(t) = \mathrm{Re}X(t) + i\mathrm{Im}X(t)$, where both $\mathrm{Re}X(t)$ and $\mathrm{Im}X(t)$ are real-valued functions. Show that as functions of t, $\mathrm{Re}X(t)$ and $\mathrm{Im}X(t)$ are linearly independent. (Hint: Start by showing that the real and imaginary parts of V are linearly independent.)