18.06 (Fall '12) Problem Set 8

This problem set is due Thursday, November 15th, 2012 by 4pm in 2-255. The problems are out of the 4th edition of the textbook. For computational problems, please include a printout of the code with the problem set (for MATLAB in particular, `diary("filename")` will start a transcript session, `diary off` will end one, also copy and paste usually work as well.)

1. Do Problem 29 from 6.1.
2. Do Problem 31 from 6.1.
3. Do Problem 18 from 6.2.
4. Do Problem 30 from 6.2.
5. Do Problem 36 from 6.2.
6. Do Problem 6 from 6.3.
7. Do Problem 10 from 6.3.
8. Do Problem 1 from 8.3.
9. Do Problem 8 from 8.3.
10. Use Matlab or otherwise to see a histogram of the eigenvalues of a random matrix.

    ```
    a=randn(1000); s=a+a'; hist(eig(s),50)
    ```

    The resulting picture is known as Wigner's semicircular law ... and the picture may look like a semicircle or a semi-ellipse depending on the details of your scaling..

    Try to find a good approximate formula for the largest and smallest (most positive and most negative) eigenvalue as a function of the size of the matrix.

    See if you can fit a smooth curve to the histogram.

    Stock market analysts use eigenvalues (and singular values) to look for deviations from Wigner's law. These are considered market opportunities for diversification.