CIS 511: Spring 2015
Problem Set 7: Due April 29 by 5 PM

1. Problem 8.27
2. Problem 8.31
3. Problem 8.33
4. Problem 9.13
5. Problem 9.14
6. Recall that we proved the following: let P be an n-variable polynomial, which has degree at most d in each variable, and let S be a set. If we pick $r_1, \ldots, r_n$ uniformly and independently at random from S, then

   $$\Pr[P(r_1, \ldots, r_n) = 0] \leq \frac{nd}{|S|}$$

   We will strengthen this result now. Define the total degree of a monomial $x_1^{k_1} \cdots x_n^{k_n}$ to be $t = k_1 + \ldots + k_n$, and define the total degree of a polynomial to be the maximum total degree of its monomials. Now let P be an n-variable polynomial of total degree t, and S a set. Show that if $r_1, \ldots, r_n$ are picked uniformly and independently at random from S, then

   $$\Pr[P(r_1, \ldots, r_n)] \leq \frac{t}{|S|}$$

7. Problem 10.19
8. Problem 10.20