**Math 2865 Assignment #2**
**Due: Oct 18ᵗʰ, 2007**

1) How many permutations of the letters *a, b, c, d, e, f, g* contain neither the pattern *bge* nor the pattern *eaf*?

2) How many permutations of the letters *a, b, c, d, e, f, g* have either two or three letters between *a* and *b*?

3) A woman has 9 close friends.
   a) In how many ways can she invite 6 of these to dinner?
   b) Repeat a) if two of her friends are divorced (from each other) and don't want to attend together.
   c) Repeat a) if the friends consist of three single people and three married couples and, if a husband or wife is invited, the spouse must be invited too.

4) How many different collections of ten coins can be made from pennies, nickels, dimes, and quarters?

5) What is the coefficient of $x^{25}$ in the binomial expansion of $\left( 2x - \dfrac{3}{x^2} \right)^{58}$?

6) How many binary sequences of length 20 are there that start with a run of 0s, that is, a consecutive sequence of at least one 0; then a run of 1s; then a run of 0s; then a run of 1s; and finally finishing with a run of 0s.

7) Show by a combinatorial argument that $\dbinom{2n}{2} = 2\dbinom{n}{2} + n^2$  Hint: Look at it as selecting 2 people out of *n* men and *n* women. How many ways can you do that?

8) Show that $\dbinom{n}{1} + 6\dbinom{n}{2} + 6\dbinom{n}{3} = n^3$