1) Consider two genes each with two alleles. p_1 is the frequency of the A_1 allele, p_2 is the frequency of the A_2 allele, q_1 is the frequency of the B_1 allele, and q_2 is the frequency of the B_2 allele. Answer the following questions for $p_1 = 0.7$ and $q_1 = 0.5$. Show your work.

a) Assuming linkage equilibrium, what are the frequencies of all possible gametes?
b) What is the theoretical maximum of D (i.e., D_{max}; note equation 3.10 in the book is correct — I may have gotten it backwards in class)?
c) What are the frequencies of all possible gametes if D is 50% of its theoretical maximum?.
d) What are the frequencies of each allele (i.e., what are p_1, p_2, q_1, and q_2) if c above is true?
e) If after 5 generations the disequilibrium is now 0.025, what is the recombination rate between the two genes?
f) if the recombination rate is 0.5 (i.e., the genes are unlinked), how long does it take for the population to be in gametic equilibrium?

2) Below are the genotypic frequencies for two genes in a natural population. Answer the following questions.

GENOTYPE	FREQUENCY
$A_1A_1B_1B_1$	13
$A_1A_1B_1B_2$	92
$A_1A_1B_2B_2$	173
$A_1A_2B_1B_1$	22
$A_1A_2B_1B_2$	164
$A_1A_2B_2B_2$	313
$A_2A_2B_1B_1$	9
$A_2A_2B_1B_2$	73
$A_2A_2B_2B_2$	141
TOTAL	1,000

a) are the loci in Hardy-Weinberg equilibrium?
b) The numbers of observed chromosome types are $A_1B_1 = 304$, $A_1B_2 = 751$, $A_2B_1 = 113$, and $A_2B_2 = 832$ (assume a chromosome type is the same as a gamete type). Are these genes in linkage equilibrium? If not, what are the D and D' values?

3) Below is a partially completed mating table used to calculate gamete frequencies with linkage. In class I solved P'_{11} when r = 0 (i.e., complete linkage). Please finish filling in the table without looking at your notes and solve for P'_{12} and P'_{22} for when $r \neq 0$ (i.e., don't drop the r).

		Gamete Pool			
Genotype	Frequency	A_1B_1	A_1B_2	A_2B_1	A_2B_2
A_1B_1/A_1B_1	P_{11}^2				
A_1B_1/A_1B_2	$2P_{11}P_{12}$				
A_1B_2/A_1B_2	P_{12}^2				
A_1B_1/A_2B_1	$2P_{11}P_{21}$				
A_1B_1/A_2B_2	$2P_{11}P_{22}$				
A_1B_2/A_2B_1	$2P_{12}P_{21}$				
A_1B_2/A_2B_2	$2P_{12}P_{22}$				
A_2B_1/A_2B_1	P_{21}^2				
A_2B_1/A_2B_2	$2P_{21}P_{22}$				
A_2B_2/A_2B_2	P_{22}^2				
		P_{11}'	P_{12}'	P_{21}'	P_{22}'