1. From the textbook: 6.3, 6.5, 6.6, 6.13, 7.1, 7.4., 7.6, 8.3, 8.4, 8.11, 9.5, 9.6, 9.13, 10.17, 10.19, 10.20, 10.23.

2. According to http://facts.stanford.edu, there are 6980 undergraduate students at Stanford. Let M be the 6980×6980 matrix whose ij entry is 1 if student i and student j have met each other and 0 if they have not met. Let $\mathbf{u}$ be the vector in $\mathbb{R}^{6980}$ whose all entries are equal to 1. What does the vector $M\mathbf{u}$ represent?

3. (a) Suppose there are 30 students in your math 51 section. At the end of the quarter, your TA makes a matrix G with 30 rows and 4 columns. Row i of G contains first the HW score, then the two midterm scores, and then the final exam score for student i (all out of 100%). Let $\mathbf{v}$ be the vector in $\mathbb{R}^4$ whose entries are .1, .25, .25, and .4. What does the vector $G\mathbf{v}$ represent?

   Hint: See http://www.stanford.edu/class/math51/index.html#grades

   (b) Let $\mathbf{w}$ be the vector in $\mathbb{R}^{30}$ each of whose entries is 1/30. What does the dot product of $G\mathbf{v}$ and $\mathbf{w}$ represent?

4. In a classroom with 5 students, is it possible to form 6 distinct groups such that every two groups share exactly 1 student?

   Hint: Suppose you could. Let $v_1, v_2, \ldots v_6$ be vectors in $\mathbb{R}^5$ such that v_i is a vector whose entries consist of 0's and 1's as to encode the i-th club membership: the $j-$th component of v_i is 1 if student j is in the i-th club, and 0 otherwise. What does then the dot product $v_i \cdot v_j$, for $i \neq j$, represent? Use that to show that $v_1, v_2, \ldots v_6$ must be linear independent vectors in $\mathbb{R}^5$ (which cannot possibly happen!) as follows: if $c_1v_1 + c_2v_2 + \ldots + c_6v_6 = 0$, try expanding

$$(c_1v_1 + c_2v_2 + \ldots + c_6v_6) \cdot (c_1v_1 + c_2v_2 + \ldots + c_6v_6) = 0$$

   and conclude that $c_1 = c_2 = \cdots = c_6 = 0$. Make sure to use the fact that $c_1^2 + c_2^2 + \cdots + c_6^2 + 2(c_1c_2 + c_1c_3 + c_1c_4 + \cdots + c_5c_6) = (c_1 + c_2 + \cdots + c_6)^2$ and that $||v_i||^2 \geq 1$.