SECOND HOMEWORK

Sultan Qaboos University College of Science

Department of Mathematics and Statistics

Mathematics for Teachers I **MATH 3207**

Instructor: Ziyad Al-Sharawi (Office 0224, Phone 24142215) **Fall 2013**

Due Date: End of Week 11.

Instructions: In each of the following questions, you need to show your complete, mathematically correct and neatly written solution. Your submitted work must be well-organized and stapled.

Q1: Give a complete and concise definition for each of the following: Basis, Linear Transformation, Linearly independent set of vectors, a function, a shear transformation.

Q2: Prove that a linear transformation on $\mathbf{R}^2$ must take a line into a line or a point.

Q3: Draw any quadrilateral, then connect the midpoints of the drawn quadrilateral consecutively to obtain a new quadrilateral. Use vectors to show that the obtained quadrilateral is a parallelogram.

Q4: In how many ways can a committee of five people be chosen from seven men and four women so as to give the men a majority if at least one women is included?

Q5: What is Pascal's identity, then prove it using a combinatorial argument?

Q6: Use mathematical induction to prove that

$$\binom{n}{0} - \binom{n}{1} + \binom{n}{2} - \binom{n}{3} + \binom{n}{4} + \cdots + (-1)^n \binom{n}{n} = 0.$$

Good Luck