MATH 301/501 HOMEWORK–5 DUE AT THE BEGINNING OF CLASS ON TUESDAY, NOVEMBER 3

One goal for this course is for you to develop your skill in effectively communicating mathematics. With this in mind, you should clearly write up your solutions. Solutions with little or no justification will receive little or no credit.

(1) Three undergraduates, four professors and three graduate students wait in line at the SAC.

   (a) How many ways are there for them to line up if the undergraduates go first, followed by the graduate students, followed by the professors?
   (b) How many ways are there for them to line up if the undergraduates are together, the grad students together, and the faculty together?
   (c) How many ways are there for them to line up?

(2) Suppose you pick four cards from a standard deck of 52.
   (a) What is the probability that you draw four aces?
   (b) What is the probability that you draw exactly two aces in a row?
   (c) What is the probability that you draw exactly two black cards and exactly two queens?

(3) Suppose A and B are two sets. Using our set-theoretic definition of probability, prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.

   You can use, without proof, any of the other results we proved in class.